TANGANYIKA

Annual Report
of the
Medical Department
for the year ended 31st December
1949

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Annual Report of the Medical Department for the year 1949

I.—GENERAL

No major development in the medical and health services of the Territory can be reported as having taken place in 1949. The most important event of the year from the point of view of future progress was the visit of Dr. E. D. Pridie, Chief Medical Officer to the Colonial Office. In October and November Dr. Pridie made an extensive tour of the Territory, and subsequently submitted a report to Government. A summary of this report and Government's views thereon was printed as Legislative Council Sessional Paper No. 2 of 1949.

2. At the beginning of 1949 the Eastern and Southern Provinces were combined for purposes of medical administration under one Provincial Medical Officer stationed at Morogoro. A Medical Officer of Health for the two Provinces was appointed in April and worked from Dar es Salaam until September when he took up his headquarters in Lindi.

3. Under the auspices of the Colonial Medical Advisory Council the Territory was visited during the year by Dr. E. R. Cullinan, F.R.C.P., Physician at St. Bartholomew's Hospital and Gordon Hospital, and Examiner in Medicine, University of London, and by Sir Stewart Duke-Elder, K.C.V.O., F.R.C.S., Surgeon Oculist to His Majesty The King, Director of Research, Institute of Ophthalmology, London University. Both of these visitors made short, but fairly extensive tours meeting a number of medical officers and members of the health staff. Dr. R. Lewthwaite, O.B.E., M.R.C.S., F.R.C.P., Director of Colonial Medical Research also spent a few days in Tanganyika in November.

II.—STAFF

4. Recruitment of professional staff proceeded very slowly and, as a result of retirements, transfers and resignations there are fewer European medical and specialist staff and nursing sisters on the actual effective strength of the Department at the end of the year than in December, 1948.

5. The tabulation of authorized establishment and strength state as at 31st December, 1949, (Statistical Table 1) merely indicates the deficiency in personnel on the last day of the year and requires collation with turnover during the year. The most significant elements of wastage by requirements, resignations and transfers and new intake are to be found in the Senior Service (Tables 2 and 6). A breakdown of the turnover shows the following :—

Class	Intake	Depletions	Net Increase
Nursing Officers all ranks	27	19	8
Medical Officers all ranks	12 (2 on contract)	10	2
Health Inspectors	6	1	5
Others	9	8	1
Totals	54	38	16

6. With an overall deficiency in the Senior Service at the end of 1947, it seems possible that should the authorized establishment remain constant, and the other factors not be accelerated in the case of recruitment and retarded in the case of wastage, it may take another three years to reach establishment strength. There is some comfort to be had even in this indication of a changing trend. It has not yet however been possible from the available professional strength to organize a leave and casualty relief pool that allows for these contingencies and at the same time will permit the manning of stations that were degraded during the war to a lesser status than medical officer stations. Only the personnel responsible for postings are fully conscious of the close margin upon which the service has been maintained, and only the clinical and field officer is aware of the qualitative and quantitative deficiency between demand and supply of what may be truly estimated as medical services. Notwithstanding these stresses and strains, there are evidences that the medical team is beginning to regain confidence in itself.

7. One very undesirable result of the shortage is the necessity for constant movement of qualified staff to cover off essential posts. As an indication of the difficulties involved the case of the Central and Western Provinces may be cited, where of the twenty-four European officers employed by the Department, only four (including two temporary Nursing Sisters) served in the Provinces throughout the whole year. Out of eighteen Asian medical practitioners and one African Assistant Medical Officer only six completed the full year in the Provinces.

8. On the specialist side the Territory lost during the year the services of the Surgical Specialist, the Specialist Psychiatrist, the Specialist Ophthalmologist and the Sleeping Sickness Specialist, all of whom had given many years of valuable service to Tanganyika. None of these officers had been replaced by the end of the year, but pending the appointment of a Surgical Specialist, a surgeon has been made available temporarily to Government through the generosity of the Overseas Food Corporation. Dr. A. W. Williams returned to his previous post at Makerere College, Uganda, and Dr. A. C. E. Cole was appointed to replace him as Medical Specialist.

9. Dr. Pridie has stated his opinion that the shortage of British European staff, professional and non-professional, is the greatest single factor militating against development of the medical and health services of the territory along the lines of policy laid down in his report and accepted by Government. Every effort is being made to expedite recruitment, but it is obvious that immediate spectacular results cannot be expected.

III.—RESEARCH

10. The Filariasis Research Unit, which arrived in the Territory in 1948 under the auspices of the Colonial Medical Research Council, has moved from Tanga, and has been established at Mwanza where it is continuing investigations in the Lake area, with special reference to the effects of new chemotherapeutic agents in the treatment of filariasis. Work on temporary housing had begun by the end of the year, and a temporary laboratory was completed in the hospital grounds. During the greater part of the year laboratory and office accommodation were provided for the Unit as a temporary measure in the hospital buildings.

11. The East African Medical Survey Unit remains based at Malya pending the provision of accommodation in Mwanza where it is proposed to establish a joint headquarters with the Filariasis Research Unit. A population survey on a limited scale was carried out in parts of the Sengerema Chiefdom near Malampaka; largely as an experiment in testing techniques.

12. In the Medical Laboratory in Dar es Salaam a special survey was carried out in connection with the sickle cell trait in local African school children. Investigation of the incidence and types of shigella and salmonella infections in Dar es Salaam continued during 1949, and particulars of this investigation will be found in the report of the Senior Pathologist at Appendix IV.

13. Details of work carried out by the Malariologist and by the Nutrition Officer are included in the reports of these officers at Appendix II and Appendix III respectively.

IV.—URBAN WORK AND HOSPITALS

Dar es Salaam Hospitals

14. In January, 1949, a lay Superintendent of Hospitals was appointed to take over from the Acting Senior Medical Officer all administrative work of the Dar es Salaam group of hospitals. A Clinical Staff Committee, having responsibility for all medical matters and affording liaison between the medical and administrative sides of the group organization, was formed during the early part of the year and has met twenty-seven times. The Nursing staff is under the immediate supervision of an Acting Group Matron responsible to the Matron-in-Chief, with a Nursing Sister in charge of each separate hospital.

15. A Group Hospital Store, holding bulk stores for all the Dar es Salaam hospitals has been formed in buildings situated in the compound of the European Hospital wing, and is operated by one European Hospital Steward. New replacements for two ambulances were supplied during the year, and two ambulances each are now stationed at the Sewa Haji and the European Hospital wings; ambulance service for the Maternity and Child Welfare Clinic and the Infectious Diseases Hospital being provided from the Sewa Haji Hospital.

16. The water shortage in Dar es Salaam has caused much inconvenience at all wings of the hospital group. At the European Hospital an electric pump had to be installed to pump water to the storage tanks, and a system of storage tanks is being installed at the Sewa Haji Hospital and the Maternity and Child Welfare Clinic. It has not yet been possible to effect any improvements at the Infectious Diseases Hospital.

European Hospital Wing.

17. The work of this wing of the group has again increased this year as is shown by the following figures :—

	1948		1949
Out-patients (new cases)	3,473	...	6,306
In-patients admissions	882	...	993

18. During the year the whole hospital was redecorated throughout, both inside and out. Dunlopillo mattresses were provided for all beds except in the isolation wards, and standard furnishings were installed in all wards. All

corridors and staircases were equipped with modern lighting, and a number of other improvements were effected. The Welfare Committee of the hospital met on seven occasions, and it was found possible to carry out most of the suggestions put forward by the Committee.

Sewa Haji Hospital Wing.

19. Here also there has been a further increase in work during 1949. The Medical Specialist reports that pneumonia remains the most frequent cause of admission to the Medical wards. Results have been good, with low mortality, and treatment was simplified during the last three months of the year by the use of Procaine Penicillin. One injection daily for three to four days suffices in the majority of cases.

20. The anæmias resulting from ankylostomiasis infestation in conjunction with malnutrition, chronic malaria and other debilitating diseases are responsible for a considerable demand for bed accommodation. Here treatment inevitably takes time, though some acceleration with intravenous iron injections has been noted. The number of Typhoid fever recordings remains steady.

21. Considerable difficulty is experienced in the Administrative and Record Department of the hospital which is inadequately staffed to deal with the great volume of work; particularly that connected with the Out-patients Department. A system of barricades has been erected in an endeavour to control the daily hordes of out-patients.

22. A number of minor improvements were effected in the wards, and the whole hospital was redecorated internally during the year. The Welfare Committee met on eight occasions, and collaboration between members of this Committee and the hospital staff is most satisfactory.

23. A Dental Clinic, with a European Dental Surgeon in attendance, operated daily in the hospital throughout almost the whole year.

Infectious Diseases Hospital Wing.

24. This hospital has continued under the supervision of the Medical Specialist, with an African Assistant Medical Officer or Asian Sub-Assistant Surgeon doing daily rounds of the wards. A number of minor improvements have been made, a small laboratory set up, wards rebuilt, etc., and the Nursing Sister, whose appointment to the hospital was reported last year, has done much to raise the standard of the hospital.

25. The main work of this hospital continues to be with tuberculosis and leprosy. The Medical Specialist reports that the majority of cases of Tuberculosis are beyond treatment, but good results with collapse therapy have been obtained in selected cases. A fairly large scale trial is being made of the new Sulphone drug ''Sulphetrone'', in the treatment of leprosy. Nine cases with nearly six months treatment were taken over, and treatment has been started in another twenty-eight cases. Preliminary findings indicate that there is a considerable improvement in the severe lepromatous cases in the first half year, but then a stationary stage was reached. It is hoped that after twelve to eighteen months a number of cases can be discharged as ''non-infective'' or ''quiescent''.

Maternity and Child Welfare Clinic.

26. The following figures give an indication of the work carried out during the year :—

Confinements in the Hospital	516
Live births	482
Stillbirths	39
Maternal deaths	7
Infant deaths	26

A further 100 mothers were admitted whose infants had been born at home or on the way to the hospital. There were eight stillbirths among these cases. One mother was admitted with triplets on the tenth day of the puerperium. Two hundred and two women were admitted to the hospital with disorders of pregnancy, and were discharged undelivered.

27. *Causes of Stillbirths*

10 Syphilis..
4 Cranial Trauma.
4 Prematurity associated with primary anæmia of the mother.
3 Prolapsed Cord.
3 Prematurity per se.
1 Placenta Prævia.
2 Accidental Hæmorrhage.
1 Difficulty with shoulders.
1 Primary Uterine Inertia.
1 Chronic Nephritis.
16 Unknown cause.

Causes of Maternal Deaths

3 Shock.
1 Peritonitis.
1 Nephritis (chronic).
1 Cardiac failure, associated with Focal Necrosis of Myocardium.
1 Pulmonary Embolism following blood transfusion.

Causes of Infant Deaths

16 Prematurity.
4 Syphilis.
2 Pneumonia.
2 Cerebral Hæmorrhage.
1 Congenital Heart Disease.
1 Unknown Cause.

28. There were 4,616 attendances at the Ante-natal Clinics, and 196 mothers attended the Post-natal Clinics which were established in March for examination of mothers six weeks after confinement. There were 8,474 attendances at the Child Welfare Clinics, and 718 children were vaccinated during the year.

PROVINCIAL HOSPITALS

29. In general the standard of maintenance of hospital buildings showed little improvement during the year. For the most part Public Works at Government hospitals were confined to minor and maintenance works. Some Provincial Medical Officers report that works for which provision of funds had been approved in the 1949 estimates were not carried out owing to failure to obtain materials or labour.

30. In the Western Province a new hospital was built at Kibondo to replace the collection of huts that had been in use for so long. The new buildings were not fully completed at the end of the year, and it is hoped that they will come into use early in 1950. A start was made on the new hospital for Sumbawanga; foundations for two blocks were laid, and material collected. The new site is quite close to the old one, and as the scheme is a long-term project the old hospital will only gradually be replaced by the new one.

31. Tabora hospitals received considerable attention during the year. At the African hospital a garage was built, the laboratory extended, a new dhobi

shed provided and a new pit latrine erected to serve the out-patients Department. A new ceiling was provided in one ward, and a small wattle and daub "ward" built to accommodate the odd offensive case such as leprosy or smallpox. A new sluice room was provided in the European wing, and both hospitals were completely redecorated.

32. In the Lake Province X-ray units were finally installed during the year at Bukoba and Musoma, and represent a most valuable diagnostic aid to the two hospitals. The roof of the European ward at Mwanza, which was found to be in a dangerous condition, was replaced by a tiled roof, and the provision of white ceilings on the veranda of this old ex-German building has done much to lighten its gloomy interior, while a more suitable consulting room and patients' waiting room were provided. The advent of the rains in December made necessary the evacuation of three temporary "banda" wards at Mwanza built during the war, and it is hoped to commence the erection of semi-permanent buildings to replace them early in 1950. The Musoma hospital was completely redecorated during the year—a measure which was badly needed, and a small isolation ward was built at Shinyanga, sited with a view to its use as a kitchen block if further extensions to the wards of this hospital are made in future years. Mortuaries were built at Shinyanga, Shanwa, Biharamulo and Ngara.

33. Work was commenced on a new operating theatre at the African Hospital, Mbeya, but no other building work was carried out at any of the hospitals in the Southern Highlands. In the Eastern Province the only building work carried out was the erection of a mortuary and of a new yard at Mahenge to replace three unserviceable buildings.

34. At Korogwe no works other than very minor essential maintenance were authorized in anticipation of the erection of a new hospital on a site outside the present Township.

PROVINCIAL TOWNSHIPS AND MINOR SETTLEMENTS

35. Serious overcrowding and unsatisfactory housing conditions are reported from many areas. In December, a sample survey in the Ngamiani area of Tanga revealed a forty-four per cent overcrowding rate using the standards of the 1935 Housing Act. The situation is to be considered by the Township Authority at the first meeting in 1950.

36. Poor standards of African and Asian dwelling houses and overcrowding are also reported from Dodoma and Tabora. As is well known, Tabora became notorious for lack of water during the year, and Dodoma experienced an acute shortage towards the end of the year. The Provincial Medical Officer, Central and Western Provinces reports :—

> "While lack of water may be beneficial in mosquito control it is dreadful when a so-called "water-borne" system of sanitation is in use. While the European and Asian communities experienced acute discomfort, the African community generally experienced real hardship. While great praise is due to the Public Works Department for maintaining even a limited supply of water under great and various difficulties, the fact that there was no widespread epidemic due to lack of water can only be regarded as a beneficent "Act of God".

37. The Provincial Medical Officer, Southern Highlands Province reports :—

> "Mbeya and Iringa have continued to grow rapidly with many new buildings. Building plans submitted by Mbeya plot holders were generally of a reasonable standard, but most of those in Iringa strayed far from requirements of the Building Rules, and on the advice of the Health Inspector usually had to be returned several times for amendment.
>
> At Mbeya repairs and alterations to the meat market have been carried out. A new standpipe and hose is used for cleansing both the meat and the produce markets and for laying dust in the dry season. A refuse lorry was purchased.
>
> Both Mbeya and Iringa were without the services of a Township Foreman for several months during the year. This loss was particularly marked at Iringa, where various works recommended by the Medical Department often had to be postponed. With the appointment of a new Foreman at each Township, however, matters are improving.
>
> Iringa has a very active Hotels Board, which is doing much to raise the standards of hygiene and comfort of the hotels in this district.
>
> At the beginning of the year sanitary conditions in Chunya were poor. This was due partly to a very large number of nuisances, etc., being allowed to remain unabated on private premises. Notices have since been served to remedy defects, demolish ruinous buildings, etc., and these have been most effective.
>
> Licensing of business premises under the Township Rules was carried out at Mbeya for the first time. A bakery and an eating house were closed temporarily for not being up to the required standards. Business premises in Iringa and Chunya are to be licensed for 1950.
>
> Njombe is the largest Minor Settlement, and is expected to grow rapidly as the Wattle Scheme gets under way. Little attempt had been made to improve general sanitation until the last few months of the year. Notices were then served, and many nuisances abated".

38. From the Lake Province the Provincial Medical Officer reports that the housing problem still remains acute in the urban areas, though there has been considerable building activity by Government and by private enterprise during the year. The general standard of housing in townships remains poor, and with accommodation so difficult to find, demolition notices have been served only in the most serious cases.

39. Refuse disposal in Townships is the responsibility of the Township Authority, to whom the general advice of the Health staff is available. The method of collection ranges from tipping lorries to hand carts, and the standard of this service varies greatly between Townships. The method of disposal in all cases is by controlled tipping.

40. The state of public latrines throughout the territory is generally unsatisfactory, though conditions vary greatly in different Townships.

V.—RURAL MEDICAL SERVICES

41. Owing to various factors implementation of the recommendations of the Rural Medical Services Committee, outlined in the 1948 report, was not effected during the year. A review of the rural medical services carried out during 1949 showed that the great majority of the existing centres are located outside

the area in which immediate personal supervision by a medical officer of the present inadequate staff is considered to be practical. In accordance with the recommendations of the Rural Medical Services Committee these stations would have ceased to be the responsibility of the Medical Department as regards supervision and staffing.

42. As a result of discussions with Dr. Pridie this previous policy with regard to the classification, distribution, staffing and supervision of Rural Medical Centres was cancelled at the end of the year, and it has been accepted that the only satisfactory answer to the problem is to provide sufficient medical inspecting staff to keep all rural medical centres under constant supervision.

THE MLALO BASIN REHABILITATION SCHEME

43. The Provincial Medical Officer, Tanga and Northern Provinces reports as follows :—

> "During the year the Report of the Mlalo Rehabilitation Scheme was published. It marked the end of the first phase of the scheme, viz. the collection of information regarding the vital statistics of the Mlalo people, their social and agricultural habits and their general state of health. At the same time it included the setting up of a demonstration and trial of utilization with paid labour in a small controlled area.
>
> Throughout the three years duration of the scheme a small medical team has been established at Mwangoi, a village in the Basin and have provided a "dispensary" service while at the same time collecting information regarding certain selected endemic diseases. This team consisted of an African Health Information Officer of the Hospital Assistant class, a microscopist and subordinate staff, and functioned under the direction of the Medical Officer of Health, Tanga (Drs. G. A. Macgregor and W. J. M. Evans), and, more remotely the Senior Medical Officer, Tanga and Northern Provinces. In the afternoons the Health Information Officer visited the surrounding villages instructing the people in elementary principles and practice of environmental hygiene.

A. *The Census.*—A census of the people was taken and their number recorded by age groups. The following table gives the results :—

RESIDENT POPULATION—1947

(By sex and Mitaa Groups)

Mitaa Groups	Males	Females	Total
1. Handei	2,618	2,914	5,532
2. Mwangoi	2,025	2,359	4,384
3. Mlalo v	3,403	3,607	7,010
4. Lower Group	792	758	1,550
Whole Sub-Chiefdom	8,838	9,638	18,476

RESIDENT POPULATION BY AGE GROUPS

Age Groups	Male	Female	Total
0	2,298	2,353	4,651
5	1,948	1,623	3,571
10	737	747	1,484
15	1,877	2,223	4,100
35	1,420	1,889	3,309
50	558	803	1,361
All ages	8,838	9,638	18,476

2. Absentees : 1091. (These absentees comprise those persons described by the heads of families but who were not resident in the area at the time of the census. They are not recorded by sex and age. They comprise 5·6 per cent of the total recorded population).

3. During 1948 all villages were visited monthly and all Births, Deaths, Immigrants and Emigrants were recorded by "Mitaa". From these records and by methods discussed in the Medical Annexure 11, of the Mlalo Report the following have been estimated :—

1. Estimated population, Mid year 1948 ...	18,899
2. Increase of population during 1948 ...	480
3. Rate of increase of population during 1948	2·54

(1948 was a year without unusual epidemic mortality).

The age group of the present population suggests the occurrence of serious epidemics in previous years and presumably further epidemics will occur in future years. Such visitation will lower this annual rate of increase to an extent which cannot be foreseen. These matters are discussed more fully in the Mlalo Report.

4. *Estimated Live Birth Rate*, i.e. number of live births during 1948 over the estimated total population, expressed per thousand of the *de jure* population = 55/1000 population.

5. *Estimated Stillbirth Rate*, i.e. number of stillbirths during 1948 over the total births expressed per thousand of total births = 78/1000 total births.

6. *Estimated Fertility Rate*, i.e. number of live births over the female population at child bearing ages (15-44 years) expressed per thousand women = 296/1000.

(A fertility rate calculated as the number of live births over the total wives of all ages expressed per thousand wives = 244/1000).

7. *Estimated Crude Death Rate*, i.e. total deaths during 1948 over the estimated mid year *de facto* population, expressed per thousand population = 25/1000 population.

8. *Estimated Infant Mortality Rate*, i.e. deaths under one year of age during 1948 over total live births during the year expressed per thousand live births = 124/1000 live births.

All the above rates are estimated in so far as it was not possible with any accuracy to distinguish live births dying during the first few days and even weeks of life from true stillbirths. The methods used in estimating these two groups are discussed in the full report.

B. *The Health Survey.*

During 1948 and 1949 an effort was made to obtain information in respect of ten per cent of the families of the Basin, this sample being obtained at random. Detailed results of this survey are given in Annexure 11 of the Mlalo Report, and the value and limitations of the findings discussed therein. The following is a summary of the findings :—

> "*Malaria.*—Blood films were taken and examined for parasites and the presence and absence of an enlarged spleen noted.

(a) 21·4 per cent of these films were found to contain parasites on a single examination, the highest percentage being in the age group five to ten years, thereafter diminishing with age. Highest infectivity occurred in May to August.

(b) 33 per cent of all those examined had palpable spleens, the highest percentage being in the five to nine age group, thereafter diminishing with age.

The Malariologist is of the opinion that malaria in the Basin is seasonal and during February, 1949, carried out a survey confirming this opinion. He considers, however, that much of the malaria found in the Basin is acquired elsewhere.

To what extent infection is acquired locally or acquired elsewhere remains to be determined, but, as both the survey figures and Malariologist's findings show malaria is a common disease amongst the people of the Basin. *Nevertheless any scheme involving the resettlement of these people in highly malarious localities in the plains would necessitate their re-housing in carefully selected concentrations as the population at present remains highly susceptible to the malaria parasite.*

Anæmia.—The blood Hæmoglobin was determined, using the Tallquist Scale. The unreliability of this method of determination is well known and the survey has shown its great limitations in a survey of this nature. One fact emerges from its employment here, viz. that the percentage exhibiting Anæmia of a degree below sixty per cent on the Tallquist Scale decreases as age advances at adult life and thereafter remains fairly constant.

Worm Infestation.—All stools were examined for ova. Fourteen per cent of all stools examined contained the ova of hookworm the percentage rising 0·7 during the first year of life to thirty per cent of the over fifty years group. (*Cf. Anæmia*). Thirty-seven per cent of all stools contained the ova of the roundworm, the age group showing greatest prevalence being one to seventeen years. Only one per cent of stools were found to contain the ova of the tapeworm.

C. *Nutrition.*

The diets of sample families were surveyed by Miss Hilary Dewey, the Nutrition Officer and reference is made to her report 'Nutrition Survey—Mlalo Basin Rehabilitation Scheme'. Miss Dewey considers that the present diet of the people is inadequate and contributes to a low state of health. She emphasizes the need for the linking up of Agricultural and Health propaganda with the object of attaining a balanced diet."

VI.—MATERNITY AND CHILD WELFARE SERVICE

44. There has been little new to report in this field during the year, although most centres show an increase over 1948 figures for institutional deliveries, and for attendances at ante-natal clinics where these exist. The development of a really effective Maternity and Child Welfare organization must, however, be dependent upon the projection of the service into the homes of the people where, by teaching and example, the simple lessons of

hygiene, ante-natal and post-natal care can be brought home. A little learning is a dangerous thing, and the development of such a service must await the provision of sufficient trained staff under proper supervision.

45. The Provincial Medical Officer, Central and Western Provinces reports :—

> "The 'Maternity' part of this service continues to become even more popular, the total confinements returned for both Provinces as being attended numbering 7,010 as against 4,559 in 1948, the figure for the separate Provinces, divided between Government, Mission and Native Authority being :—
>
> | | *Western* | *Central* |
> |---|---|---|
> | Government Institutions | 1,210 | 190 |
> | Missions | 1,546 | 2,002 |
> | Native Authority | 921 | 1,151 |
> | Totals | 3,677 | 3,343 |
>
> The largest number of attended confinements at any one institution was at the C.M.S. Hospital at Kilimatinde (Central) with 849. The C.M.S. return 1,594 confinements at their various institutions out of the total of 2,002, the remainder (408) being at institutions of the Augustana Lutheran Mission. In the Western Province the Roman Catholic Missions attended 717 confinements at five institutions and the Moravian Mission 607 at three institutions."

46. In the Lake Province Maternity and Child Welfare Clinics are established at Mwanza and Bukoba Hospitals, and the posting of extra nursing staff to both places has resulted in an improvement in the standard of work and an increase in the turnover of patients. But the members of the present staff are nevertheless too fully occupied with clinical duties within the hospital to be able to follow up their work in the Clinics with outside visits. As a midwifery service, much valuable work is done both by these recognized clinics, and in Government Missions hospitals generally. Much of the work, however, is wasted in after years owing to the ignorance of African mothers and their neglect of their children.

47. Early in the year a Health Committee composed of members elected by the African Advisory Council, together with the District Commissioner, Medical Officer of Health and one Health Visitor, was formed in Tanga. It was hoped that this Committee would develop into the Health and Welfare Committee of the Tanga Municipality. At its first meeting the Committee elected a Maternity and Child Welfare Sub-Committee, composed of three African women. This Sub-Committee subsequently functioned in an advisory capacity to the Maternity and Child Welfare Clinic, and as a vehicle for the dissemination of knowledge in respect of the aim and functions of that unit. These women have already proved useful, both in their advisory and executive capacities.

48. Particulars of the work carried out at the Maternity and Child Welfare Clinic, Dar es Salaam, are given in paragraphs 26 to 28.

VII.—MISSION MEDICAL WORK

49. There has been a further increase in the number of qualified medical practitioners and nurses employed by Missions, and the sum paid by Government to Missions during 1949 as grants-in-aid for medical work totalled £37,258, as compared with £28,080 in 1948.

50. Statistics showing the volume of medical work carried out by Missions are far from complete. Some Missions undertake medical work although they have no medical practitioner in charge, whilst in other cases the medical practitioner is unable to exercise effective supervision over all the medical centres staffed by the Mission. Standards of practice vary very considerably.

51. A branch of work in which Missions have great advantage over the Government medical services is Maternity and Child Welfare work for which continuity of staff having a deep understanding of the African woman, her language and customs, is of great importance. It is not surprising, therefore, to find that in the Western Province, where Government maternity services are not entirely lacking, medical Missions were responsible for forty-two per cent of all recorded attended confinements, and in the Central Province for fifty-eight per cent. Many Mission stations report increases this year in the number of women attending Maternity Clinics, and the more intimate knowledge of Africans which is often enjoyed by the professionally qualified members of the Mission staffs is of great help in "getting across" some of the lessons of ante-natal, and especially post-natal care.

52. From the Lake Province the Senior Medical Officer reports that there has been steady progress in the field of Mission medical services during the year. More trained staff has arrived, and a fair amount of new building, reconditioning of old buildings and installation of new equipment has been achieved. There has been a gradual organization of the Mission dispensary systems in this Province; scheduled drug supplies and a uniform type of dispensary building and equipment have been instituted by the Africa Inland Mission, whilst the medical practitioner in charge of the medical work of the Mennonite Mission organized a course in microscopy with particular reference to tropical disease for nurses of his own and neighbouring societies.

VIII.—TUBERCULOSIS HOSPITAL-SANATORIUM KIBONGOTO

53. Tuberculosis control on Kilimanjaro comprises the combined work of :—

A chain of Dispensaries round the Mountain, and
A Hospital-Sanatorium at Kibongoto.

The Dispensaries

54. The aims and functions of the Dispensaries are to provide a centre for a home visiting service through which known infectious cases are visited and instructed in personal hygiene and their contacts examined; to detect new cases at an early stage, and to keep in touch with and treat cases discharged from the hospital. Suspicious cases are sent from the Dispensaries to the Hospital for examination and decision as to whether in-patient treatment is necessary. Out-patient cases are treated at the nearest Dispensary, any complications arising during treatment being referred to the hospital.

55. The whole question of treatment and prevention depends on the smooth running of both the dispensaries and the hospital-sanatorium, which are absolutely dependent on each other, and are under the one unified staff.

THE HOSPITAL-SANATORIUM

56. The daily average of in-patients in 1949 was 236, as compared with 214 in 1948. Ward accommodation exists for only thirty-eight patients. The dressers' side room has been converted into a general ward for male patients, and the remainder of the African tuberculosis patients are accommodated in lean-to shelters. Asian tuberculous patients live in home-made cottages, with their wives or personal servants looking after them and providing their own food. There is no European accommodation, although one Italian tuberculous patient was accommodated for a short time in an emergency.

57. IN-PATIENTS, 1949

	Tuberculous	General (Not Tuberculous)	Total
Remaining in hospital 31st December, 1948	215	11	226
Admitted during 1949	679	688	1,367
Died in hospital	78	20	98
Discharged	609	666	1,275
Remaining in Hospital 31st December 1949	207	13	220

58. Of the 894 tuberculous patients treated in hospital in 1949, 510 were Wachagga and 101 Wambulu. The balance of the African patients were derived as follows :—

Central Province	13
Eastern Province	3
Lake Province	12
Northern Province (other than Wachagga and Wambulu)	27
Southern Province	1
Southern Highlands Province	11
Tanga Province	86
Western Province	7
Kenya	59
Nyasaland	2
Uganda	1
Zanzibar	2

Thirty-four Indians, one Chinese, eighteen Arabs, three Nubians and three Somalis were also admitted during the year.

59. *Analysis of Deaths in Hospital*

Type	Cause of Death	Total
Pulmonary TB Plus	Pulmonary TB	69 (including 19 Wachagga).
Pulmonary TB Minus	Hæmoptysis	1 (Mchagga).
Pulmonary TB Minus	Myocarditis	1 (Mchagga).
Cervical Lymphatic	Disseminated TB	3 (including 2 Wachagga).
Acute Disseminated	Disseminated TB	2 (Wachagga).
Spinal	Disseminated TB	2 (1 Mchagga).
		78 (26 Wachagga).

60. *Analysis of Discharges*

(1) *Recommended for Discharge*

(i) Improved by pneumothorax or pneumoperitoneum therapy plus or minus ancillary operation—

Pulmonary TB Plus	85	
Pulmonary TB Minus	9	
	—	94

(ii) Improved by medical treatment—

Pulmonary TB Plus	4	
Pulmonary TB Minus	34	
Bronchial Lymphatic	20	
Cervical Lymphatic	17	
Lupus	1	
	—	76

(iii) Improved by operation— Cervical Lymphatic	25	25
(iv) Improved by plaster— Spinal, or Bone and Joint	16	16
(v) Transferred to Nairobi Orthopædic Centre	1	1
(vi) Transferred to Nairobi General Hospital	1	1
(vii) Admitted for observation, and discharged as free of disease though infected, or for continuing treatment as out-patients	324	324
		537
(2) *Left Voluntarily*		
(i) Ran away	24	
(ii) Discharged *in statu quo*	48	
	72	

NOTE.—Patients discharged under sub-heads (i), (ii), (iii), (iv) and (vii) continue treatment or are kept under observation by the local dispensaries or by Government or Mission hospitals outside the area of the chain of dispensaries.

61. Tubercle bacilli were eradicated from the sputum of forty-two out of 219 cases of Pulmonary Tuberculosis Plus. This is the highest percentage (nineteen per cent) ever recorded in the hospital, and compares very favourably with that of other years. In 1948, for instance, the figure for conversion to TB negative was nine per cent, whilst even in 1941 when cases for admission were selected very carefully the percentage was eighteen. Considering that during the last few years "anyone in any condition from anywhere" has been accepted for admission the results obtained in 1949 are very encouraging. The Specialist believes that the improvement has been achieved by insisting on more extensive bed rest, and by carrying out refills every day instead of twice weekly as in the past. Great credit is due to the hospital staff for whom this has meant much additional work.

62. The Specialist points out that despite these encouraging results statistics for 1949 show that, even with the most optimistic prognosis, only one in every five pulmonary turberculosis cases can apparently hope to be rendered non-infectious once they have become pulmonary TB Plus. Moreover, although trial use has been made of the new drugs, sulphetrone, P.A.S. (para-amino-salicylic acid) and streptomycin or its derivatives, it has been found that generally speaking pneumothorax or pneumoperitoneum therapy must be relied upon for treatment of the pulmonary case.

PNEUMOTHORAX AND PNEUMOPERITONEUM THERAPY

63. *Pneumothorax.*

One hundred and sixty-two inductions were performed on one hundred and thirty-three individuals admitted to hospital during the year :—

123 on one side in 123 cases.
29 turning 29 of the above into bilaterals.
10 on one side with pneumoperitoneum on the other side.

Apart from these 133 individuals there were ninety-three remaining in hospital from 1948 who continued their refills. Fifty-seven were unilateral, and twenty-two bilateral. Fourteen others were receiving this treatment in combination with pneumoperitoneum. These 226 individuals received a total of 10,125, refills during the year.

64. *Pneumoperitoneum.*

Fifty inductions were performed during 1949 :—
29 without phrenic interruption.
11 with phrenic interruption.
10 in conjunction with unilateral pneumothorax.

Apart from these fifty individuals, fifty others remaining in hospital from 1948 continued refills. These 100 individuals received 1,824 refills of air during the year.

65. PNEUMOTHORAX AND PNEUMOPERITONEUM REFILLS—OUT-PATIENTS

Hospital or Dispensary	AP Refills	AP Cases	PP refills	PP Cases
Kibongoto	29	1	3	1
Kibosho	62	2	24	2
Machame	288	6	38	2
Moshi	347	16	198	8
Uru	49	2	18	1
Kilema	94	2	48	2
Marangu	102	6	—	—
Mamba	74	2	28	1
Mwika	138	6	98	3
Mkuu	28	1	48	2
Mashaiti and Ussere	128	6	48	2
	1,339	50	551	24

In addition twenty-three AP cases and twelve PP cases discharged from Kibongoto received refills at hospitals and dispensaries outside the Kibongoto area.

66. *Operations Ancillary to Pneumothorax and Pneumoperitoneum.*

Phrenicectomies, simple crush	23
Thorascopic Examination only	9
Thorascopic Examination combined with Adhesion cutting	44
Glandular Enucleation	37
	113

67. Stricter discipline and insistence on absolute bed rest amongst the great majority of the patients has taken its toll of occupational therapy. Mr. E. C. Banks, the Industrial Instructor, reports :—

> "Weaving was started in January after the purchase of one large thirty-six inches loom and a number of smaller looms, which were supposed to be bed-looms, but they could only be used by a small number of patients as the vast majority were too ill to take advantage of them. The knitting of scarfs and pullovers was continued by male and female African patients, who were paid a percentage of the profits arising from their sale as reward for their labour. By the end of the year a gross profit of Shs. 1,400/- had been made on articles woven and knitted. Two contracts with Machame Girls' School for uniforms, underwear and bedding were fulfilled. Tin work was continued, but scrap tin was difficult to obtain, and all that the workers were able to gain was a little pocket money. Towards the close of the year leather work was started, being developed through patients who had been cobblers, and this is gaining in popularity."

68. The hospital is greatly indebted to the staff and children of Machame Girls' School who arranged a fête to raise money to assist in the work of occupational therapy, and to the Moshi branch of the Women's Service

League who organized a garden party also in aid of the hospital, whilst special gifts of sweets, cigarettes and food were presented to the patients at Christmas by the Red Cross Society.

Tuberculosis Survey in Moshi Township

69. In a limited survey which was carried out in Moshi Township four schools (two Indian, one Arab and African Moslem, and one African Native Authority school), one Indian Street and three African Streets were selected as a sample of the population. A total of 1,871 persons were tested by the graded tuberculin test, and ninety-five per cent of the positive reactors were fluoroscoped. The Specialist, Tuberculosis, states :—

> "Taken far and by, if the material of this survey was as fair a sample of the population as it appeared to be, I am very favourably impressed with the health of Moshi so far as tuberculosis is concerned."

HEALTH OF CHILDREN IN MOSHI TOWN AS COMPARED WITH THAT OF CHILDREN IN MACHAME, IN MBULU DISTRICT AND AT ARUSHA EUROPEAN SCHOOL

Group	Age Period	No. Tested	Positive Reactors	Percentage Positive	Disease	Percentage of Disease to No. Tested.	Disease			Percentage of Infectious Disease to No. Tested.
							Early and Symptomless	With Symptoms	Infectious	
African children in Moshi	Infancy to 19	521	219	42%	52	9%	51 9%	1 .1%	1	1%
Indian children in Moshi	Infancy to 19	796	185	23%	26	3%	24 3%	2 .2%	Nil	Nil
African children in Machame ...	Aet. 4 to 19	1,660	398	23%	96	5%	88 5%	8 .4%	1	.06%
African children in Mbulu	Infancy to 19	2,804	867	30%	139	4%	77 2.7%	62 2%	20	.7%
European School, Arusha	Aet. 5 to 16	177	25	14%	1	.5%	1 .5%	Nil	Nil	Nil

Comment.—The health of African children compares quite well in Moshi with those of Machame, for although the percentage of disease is higher, it is almost entirely "early and symptomless", and though "infectious" is a little higher "disease with symptoms" is lower. With Mbulu it compares better still, for although the percentage of disease is higher, that of "disease with symptoms", and "infectious disease" is much lower.

The health of Indian children in Moshi compares favourably with that of all the others with the exception of the European children of Arusha School who win hands down.

HEALTH OF MOSHI TOWN AS COMPARED WITH MACHAME AND MBULU

Group	Age Period	No. Tested	Positive Reactors	Percentage Positive	Disease	Percentage of Disease to No. Tested.	Disease			Percentage of Infectious Disease to No. Tested.
							Early and Symptomless	With Symptoms	Infectious	
Moshi Township ...	All ages	1,871	847	44%	107	5%	101 5%	5 .2%	1 .05%	.05%
Machame District ...	All ages	2,287	824	36%	175	7%	153 6%	22 .9%	2 .08%	.08%
Mbulu District ...	All ages	5,006	2,358	47%	228	4.5%	112 2%	115 2%	30 .6%	.6%

Moshi Township will be seen to compare favourably with Machame, and Mbulu.

IX.—MENTAL HOSPITALS

70. This has been a particularly difficult year for the Mental Hospitals at Dodoma and Lutindi. Opening of a new hospital at Dodoma for criminal lunatics which is urgently required, had to be postponed owing to the acute shortage of water, and the planned closure of the Lutindi hospital could not, therefore, be effected. There was a serious shortage of nursing staff throughout most of the year, and in October Dr. E. J. Foley, the Specialist Psychiatrist, who had been in charge of the Dodoma hospital since 1937 left the Service on retirement. In spite of every effort a replacement has not yet been appointed, and the Mental Hospital remains under the general charge of the Medical Officer, Dodoma.

71. Admissions to the Dodoma hospital during January and February were on an unprecedented scale, and serious overcrowding, coupled with shortage of staff, made it necessary to stop further admissions from the middle of February. A few urgent cases were admitted during April, and from May onwards new cases were accepted on a normal scale. The amount of active treatment which could be carried out was strictly limited, and the standard of nursing suffered, with a serious increase in the death rate. In spite of this a creditable discharge rate was maintained.

72. Dodoma. (Total authorized accommodation—234 beds).

	Male	Female	Total
Remaining at 31st December, 1948	150	67	217
Admitted during 1949	144	52	196
Discharged	90	29	119
Died	28	10	38
Escaped	2	—	2
Remaining at 31st December, 1949	174	80	254

The overcrowding in Dodoma hospital was such that twenty-five beds had to be transferred from Lutindi, and some of the European accommodation which had not been fully used since the end of the war was taken over for African patients.

73. *Analysis of Admissions.*

Acute Melancholia	8
Recurrent Melancholia	3
Dipsomaniac Melancholia	1
Mania Depressive Psychosis	9
Acute Mania	26
Recurrent Mania	12
Katatonic Schizophrenia	16
Simple Schizophrenia	21
Hebephrenic Schizophrenia	5
Dementia Paranoides	12
Confusional	25
Cerebral Syphilis	4
Delusional	1
General Paralysis	8
Paraphrenia	1
Epilepsy	21
Senile Dementia	7
Puerperal Insanity	4
Climateric	1
Mental Deficiency	11
Total (including 32 Criminal Lunatics)	196

74. *Analysis of Discharges.*

Discharged, improved	38
Discharged, cured	81
Total	119

75. *Analysis of Deaths.*

Cerebral Hæmorrhage	2
Chronic Hepatitis	2
Acute Mania	1
Myocardial Degeneration	2
Bronchiectasis	1
Ankylostomiasis	1
Emaciation	1
Pleurisy	1
General Paralysis	3
Lung Abscess	2
Ovarian Cyst, Fibroid Uterus	1
Senile Dementia	1
Chronic Nephritis	1
Pulmonary Tuberculosis	3
Lobar Pneumonia	1
Influenza	1
Status Epilepticus	2
Anæsthesia	2
Bronchopneumonia	2
Schizophrenia	2
Enterocolitis	2
Coronary Arteriosclerosis	1
Anæmia, Presenile Dementia	1
Acute Melancholia	1
Exhaustion Psychosis	1
Total	38

76. *Analysis of Patients remaining on 31st December, 1949*—By Race.

	Male	Female	Total
European	2	1	3
Asian	7	5	12
African	165	74	239
Totals (including 69 Criminal Lunatics)	174	80	254

77. *Lutindi (Total accommodation—125).*

	Male	Female	Total
Remaining at 31st December, 1948	72	38	110
Admissions during 1949	5	8	13
Discharged or transferred to Dodoma	18	14	32
Died	2	2	4
Remaining at 31st December, 1949	57	30	87

78. An analysis of the admissions to the Mental Hospital, Dodoma, by Provinces of immediate origin of the patients concerned has been undertaken. In view of the increasing strain on accommodation it seemed desirable as a first step to learn from what parts of the Territory the pressures of admissions are coming. The Graph opposite shows the sum of experience over the six year period 1943-48 as a histogram superimposed upon which is a line diagram showing the experience for 1949. It was not possible to pursue the original intention in sorting—to determine the district of ''domiciliary origin'' of the patients—so the process represents only the assortment of patients committed or referred from within the respective Provincial jurisdictions, without clear evidence that the patient's domiciliary origin necessarily lies in that jurisdiction, although it is probable that a large proportion may have such origin. Criminal cases are not included. It is probable therefore that the graphs do not indicate much more than the relative consciousness of the public and authorities for the need for custodial care and treatment of the mentally deranged or perhaps the nuisance-factor of such persons in the more urbanized sections of the Territory.

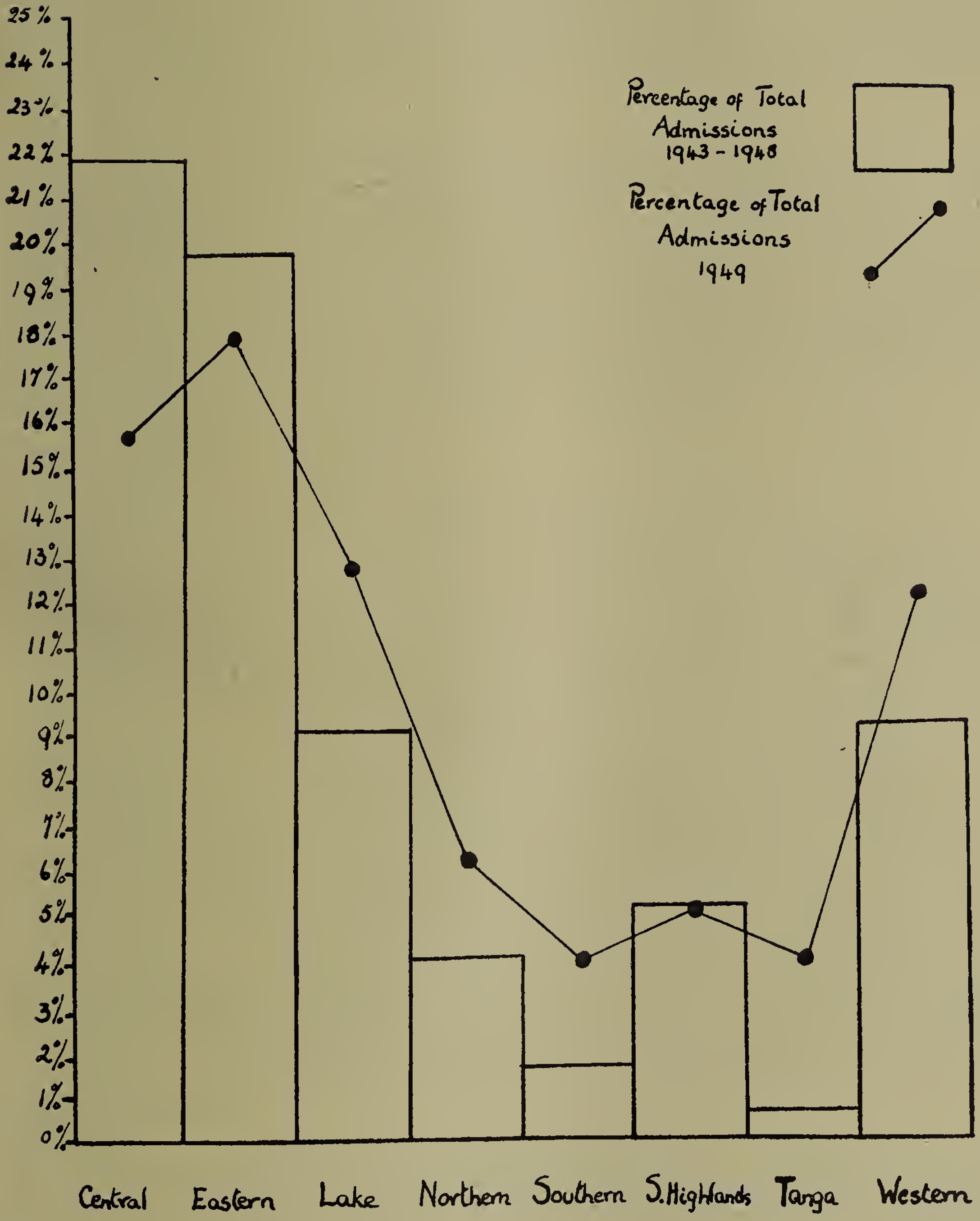
79. The predominance of ''patronage'' from the Central Province is probably due to the fact that the hospital happens to be located in that Province. The relative ease of transportation communications is possibly as good an explanation of the degree of ''patronage'' from the other Provinces as any. The fact remains that the curve for 1949 indicates a rising trend of ''patronage'' from other Provinces, the reasons for which can only be determined from a clinical analysis and correlation with the various Social pressures that may and do contribute to the onset of the psychotic state. An untilled field for investigation lies fallow for the trained and interested mental hygienist in this special hospital.

ADMISSIONS—DODOMA MENTAL HOSPITAL

Province, etc. of Origin	1943		1944		1945		1946		1947		1948		Total 1943–1948		1949	
	No.	% of Total	No.	% of Total	No.	% of Total	No.	% of Total	No.	% of Total	No.	% of Total	No.	% of Total	No.	% of Total
CENTRAL	27	30	11	18·64	32	24·62	16	11·76	30	21·90	45	24·46	161	21·88	31	15·81
EASTERN	17	18·89	20	33·90	21	16·16	38	27·94	22	16·05	29	15·76	147	19·97	35	17·86
LAKE	4	4·44	9	15·25	17	13·08	6	4·41	10	7·30	21	11·41	67	9·10	24	12·76
NORTHERN	3	3·33	–	–	4	3·08	3	2·21	1	0·73	19	10·33	30	4·08	12	6·13
SOUTHERN	2	2·22	1	1·69	–	–	2	1·47	4	2·92	3	1·63	12	1·63	8	4·08
SOUTHERN HIGHLANDS ...	6	6·67	3	5·09	7	5·38	9	6·62	4	2·92	9	4·89	38	5·16	10	5·10
TANGA	–	–	–	–	–	–	–	–	3	2·19	2	1·09	5	0·68	8	4·08
WESTERN	6	6·67	4	6·79	10	7·69	7	5·15	14	10·22	27	14·67	68	9·24	25	12·24
OTHER CERTIFICATED ADMISSIONS	–	–	–	–	–	–	–	–	–	–	2	1·09	2	0·27	–	–
MILITARY ADMISSIONS ...	4	4·44	–	–	10	7·69	19	13·97	–	–	–	–	33	4·48	–	–
TRANSFERRED FROM LUTINDI	7	7·78	–	–	10	7·69	10	7·35	–	–	7	3·80	34	4·62	11	5·61
CRIMINALS	14	15·56	11	18·64	19	14·61	26	19·12	49	35·77	20	10·87	139	18·89	32	16·32
Totals ...	90	100	59	100	130	100	136	100	137	100	184	100	736	100	196	100

MENTAL HOSPITAL DODOMA

Provincial Origin of Admissions 1943 - 1949



X.—MALARIA CONTROL

80. The Report of the Inter-Territorial Malariologist will be found at Appendix II.

Southern Province.

81. In the Mtwara Port area which, prior to its development was considered by the Malariologist to be an almost ideal coastal site for a town, there is now, despite warnings by the Malariologist and the Health Staff, increasing danger of "man-made malaria". Large undrained borrow pits formed in the course of railway construction are likely to form ideal breeding foci for *A. gambiæ*, as also are many rain filled pot holes and ruts in the innumerable sisal lanes.

82. At Mikindani the Malariologist considers that anopheles control can be achieved only by the inauguration of major engineering works. The chief breeding places are in the swamps to the north of the town (where the volume of anopheles breeding is truly formidable), and in the creeks running through the town. A proposal that these latter breeding places be controlled by the incorporation of tidal flaps in the railway embankments could not be implemented owing to engineering difficulties, but it has been recommended that an attempt be made at silting by the use of fascines.

Southern Highlands Province.

83. The Senior Medical Officer reports as follows:—

> "A new drain has been dug through the Dodoma Road swamp at Iringa, following the lowest contour, running roughly parallel to the road. This has functioned well up to the present, though final judgment on its efficiency must be reserved until the end of the rainy season.
>
> There has been an intensification of anti-mosquito measures at Mbeya. The banks of all streams and surface drains have been cleared and graded, which should greatly facilitate their future maintenance. Large numbers of borrow pits have been filled in; and an additional drain has been dug through the Iringa Road Swamp. The lower part of the Township continues to form the main breeding ground.
>
> Work at Chunya, Tukuyu and the Minor Settlements was almost completely prohibited by lack of funds. In 1950 it is intended to concentrate particularly on Chunya, where many breeding places could easily be eradicated, given the necessary labour."

Western Province.

84. The Cheyo Swamp at Tabora continues to present a problem. Unfortunately the attempt to dry the swamp by planting of one thousand gum trees has been a partial failure owing, ironically, to the prolonged drought. The experiment will, however, be tried again, and an estimate of the cost of effective drainage is also being obtained. Over 40,000 gum trees have already been planted in other areas liable to seepage in the Western Province, while at Kasulu the District Commissioner has made a commendable effort to drain the valley in the immediate vicinity of the station. The practicability of drainage of the Ujiji Swamp is also under consideration.

XI.—YELLOW FEVER SURVEYS

85. In an endeavour to settle the question of whether Yellow Fever is endemic in Tanganyika small surveys were continued throughout the year so far as staff resources allowed. In addition to the eleven positive protection tests discovered between 1946 and 1948, a further two immunes were found—one being a boy of ten years in the village of Madanga, Pangani District, and one a male aged thirty-four years in Majita village, Musoma District. In the former case the finding has been confirmed by a second test, but a "repeat" test has still to be carried out on the Musoma case. The number of blood samples submitted from Musoma in 1949 totalled thirty, while forty-four samples were collected from Tanga Province.

86. Full details of all immune cases to date are given below :—

Province	District	Age	Sex	Date bled
1. Southern	Lindi	25	F	28.6.46
2. Southern	Lindi	21	F	29.6.46
3. Southern	Lindi	23	F	2.7.46
4. Tanga	Tanga	20	F	29.7.47
5. Tanga	Tanga	25	F	28.7.47
6. Northern	Moshi	20	M	26.9.47
7. Tanga	Tanga	25	F	Dec. 47
8. Tanga	Moa Village	15	M	July 48
9. Tanga	Moa Village	14	M	July 48
10. Tanga	Moa Village	10	M	July 48
11. Tanga	Moa Village	12	M	July 48
12. Tanga	Madanga Village	10	M	1949
13. Lake	Majita Village	34	M	*1949

*Not yet confirmed by second test.

XII.—HEALTH OF LABOUR

87. A full report by the Medical Specialist, Labour Department will be found in the annual report of that Department.

88. No serious epidemics occurred among labour forces during the year, though as reported in paragraph 129 there was again an outbreak of diarrhœa and dysentery on a sisal estate near Morogoro, while a similar outbreak on a smaller scale occurred on an estate in the Arusha District. In both cases the water supply, which showed evidence of gross animal pollution is suspected to have been the main vector of the disease.

89. The Sleeping Sickness flare up in the Western Province resulted in the closing of the Kibondo Division of the Buha District to recruitment during the latter part of the year, but except in one or two cases labour was not seriously affected by the outbreaks.

90. Although the number of resident medical practitioners employed by industry has not increased, more employers are engaging the part time services of medical practitioners, while a number of hospitals of a standard which compares favourably with that of some Government institutions are now maintained by industry or are in the course of erection. Nevertheless there is still great room for improvement in preventive measures.

XIII.—TRAINING

91. The standard of candidates for training as Hospital Assistants, Pharmaceutical Assistants, Laboratory Assistants and Nursing Auxiliaries was on the whole good this year. On the other hand, acceptance of Standard VIII as the educational minimum for entry to the courses has continued to have an adverse effect upon the training of Rural Medical Aids.

92. Unfortunately the number of students under training, particularly in the case of Nursing Auxiliaries, has been restricted owing to the outstanding and continuing shortage of hostel accommodation. Nevertheless the intake of thirty new students to the Medical Training Centre, Dar es Salaam, for training as Hospital Assistants, Pharmaceutical Assistants and Laboratory Assistants was the largest yet dealt with in that establishment. The fact that a keener and more intelligent type of schoolboy is now being attracted to these courses in Dar es Salaam is reflected in the very small number (two out of fifty-eight) rejected during the year.

Hospital Assistants.

93. A total of forty-one students were under training. Of these, seven third year students completed the course and qualified in December.

During the year a revised and amplified syllabus of training was drawn up, and will be taken into use in 1950.

Laboratory Assistants.

94. Ten students were under training, of whom two completed the course and qualified in December.

Pharmaceutical Assistants.

95. Eight students were under training during the year; one completed the course and qualified in December.

Nursing Auxiliaries.

96. Seventy students (thirty-five men and thirty-five women) were under training on the "Block" system during the year, theoretical training being undertaken in the Dar es Salaam and Tanga hospitals, while, in the case of male students, practical work is carried out in the parent hospital under the direction of a European Nursing Sister. The female students follow the whole course in Dar es Salaam or Tanga.

Sanitary Inspectors.

97. Owing to shortage of teaching staff and accommodation it was not found possible to arrange any courses for Sanitary Inspectors during 1949.

Mosquito Control.

98. Two courses in mosquito control were held under the direction of the Inter-Territorial Malariologist at Muheza during the year—a senior course for ten students in April, and a course for eight Asian Supervisors during September. A short course for eleven Mosquito Searchers was held at Mbeya in May.

In addition to these courses a number of students have undergone elementary training at Muheza throughout the year with a view to employment both with Government and on estates.

Students attending these courses receive instruction in varying degrees of intensity on the identification and bionomics of mosquitoes, and the details of their methods of control.

Rural Medical Aids.

99. The Medical Training Centre at Tukuyu was closed during the year, and as forecast in the 1948 Report the Medical Training Centre at Mwanza, hitherto administered by the Native Authority, was taken over by the Medical Department. Eleven first year students and six second year students were under training during the year.

The Senior Medical Officer, Lake Province reports :—

> "The year was a difficult one; for the first two months of the training year the Medical Officer in charge was absent, sick. For the following two months he was doubling the duties of Provincial Medical Officer with tutorial duties.
>
> As a result the training programme fell badly into arrears, which could only be overcome by intensive teaching methods which are most unsatisfactory with this type of student. The eventual products at the end of the year did not compare favourably with the products of previous years."

Training by Missions.

100. St. Andrew's College, Minaki (U.M.C.A.) provides a four years course for Hospital Assistants to a standard corresponding to that of the Government Medical Training Centre at Dar es Salaam. Training for the Government Nursing Certificate is carried out at the Magila and Lulindi Mission hospitals (U.M.C.A.), and at Mvumi (Church Missionary Society), while most of the larger Mission hospitals undertake the training of subordinate nursing staff and dressers for work in the Mission rural dispensaries.

XIV.—EPIDEMIC DISEASES

Smallpox

101. *Territorial Incidence.*

Territorial Incidence

	1945	1946	1947	1948	1949
Cases	12,283	12,671	2,960	1,206	1,045
Deaths	1,815	1,935	616	209	169
Per cent Fatality	14·78	15·27	20·7	17·3	16.1

Provincial Incidence

Central :	1945	1946	1947	1948	1949
Cases	1,336	1,725	489	364	22
Deaths	225	285	73	58	—
Per cent Fatality	16·8	16·5	14·9	15·9	0·0

Provincial Incidence—(contd.)

Eastern :					
Cases	186	440	42	24	—
Deaths	—	39	8	1	—
Per cent Fatality	0.0	8·8	19·0	4·2	—
Lake :					
Cases	3,558	1,987	921	162	82
Deaths	405	497	220	15	9
Per cent Fatality	11·38	25·01	23·9	9·3	10·9
Northern :					
Cases	106	129	22	69	122
Deaths	25	33	2	8	24
Per cent Fatality	23·6	25·5	10·0	11·6	19.6
Southern :					
Cases	449	2,546	237	399	612
Deaths	11	160	30	84	125
Per cent Fatality	2·45	6·28	12·7	21·1	20.4
Southern Highlands :					
Cases	3,081	1,692	832	111	155
Deaths	93	426	243	28	8
Per cent Fatality	3·02	25·17	29·2	25·2	5.1
Tanga :					
Cases	50	97	51	3	3
Deaths	—	18	10	—	1
Per cent Fatality	0.0	18·5	19·6	0.0	33.3
Western :					
Cases	3,517	4,055	386	74	49
Deaths	1,056	477	30	15	2
Per cent Fatality	30·03	11·7	7·8	20·3	4.0

102. The Territorial incidence of smallpox has shown a steady decrease since 1946. The largest number of cases this year were reported from the Southern Province, where the majority occurred in the Liwale area of Ruponda District. It is probable that the figures here do not reflect the true position and that many cases are not notified owing to the scattered population, difficulties of communication and lack of medical staff. Seven vaccinators were employed in the Liwale area in an apparently successful effort to prevent spread of the disease to other areas in the Southern Province.

103. Two small outbreaks occurred in the Lake Province; one in the West zone early in the year, and the other in the Central zone at a later date. Both outbreaks were dealt with by means of mass vaccination campaigns in the neighbourhood of the focus of infection, and neither spread to other areas.

104. The disease continues to smoulder in the Northern Province, and though instances of infection introduced by non-immune labourers have been reported, it is probable that the difficulty of control lies in the relative failure of vaccination measures among the nomadic Masai and surrounding tribes inhabiting large tracts of land beyond the effective supervision of the Health staff. As in the case of the Ruponda District, the actual incidence of disease is probably greater than is reflected in the figures notified.

105. The Central and Western Provinces have been remarkably clear from smallpox during 1949. Of forty-nine cases and two deaths reported in the Western Province only two cases were notified from Government hospitals, and there is some doubt as to whether the other cases were correctly diagnosed. In one instance a case of smallpox reported from a non-Government institution was found to be chickenpox on examination by the Provincial Medical Officer. A similar doubt as to correct diagnosis exists in regard to the Central Province figures since none of the cases reported were notified by Government institutions.

CEREBRO-SPINAL MENINGITIS

106. *Territorial Incidence*

	1945	1946	1947	1948	1949
Cases ...	2,537	1,789	1,614	987	507
Deaths ...	546	448	380	199	146
Per cent Fatality	21·5	25·04	23·5	20·2	28.79

Provincial Incidence

Province	Cases	Deaths	Fatality Rate per cent
Central	36	9	25.0
Eastern	18	7	38.88
Lake	179	54	30.17
Northern	5	1	20.0
Southern	60	10	16.66
Southern Highlands	46	13	28.27
Tanga	22	13	59.09
Western	141	39	27.66

107. No serious outbreaks have been reported, but almost all observers report a high mortality rate in cases where it is certain that a correct diagnosis has been made. The Provincial Medical Officer, Central and Western Provinces reports :—

> ''One hundred and forty-one cases with thirty-nine deaths were reported from Western and thirty-six cases with nine deaths from Central. There is considerable doubt as to the accuracy of diagnosis in many cases. Cases coming under a Medical Officer with laboratory facilities and adequate supplies of drugs show a high mortality, whereas in returns from small stations where lumbar puncture is probably rarely done for confirmation of diagnosis, the mortality is low. For example, Tabora Hospital shows a mortality of fifty per cent, Sikonge (Dr. Reece) forty per cent, whereas Mpanda records only five per cent mortality and other small stations nil. There is no doubt in my mind that mortality is steadily rising after the initial dramatic fall in the early nineteen-forties when the sulpha drugs were first used on a large scale against this disease.''

Human Trypanosomiasis

108. *Territorial incidence of Human Trypanosomiasis by Provinces and Districts*

Province	1947		1948		1949	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
Central :						
Kondoa-Irangi	196	13	146	39	52	133
Singida	13	3	5	1	4	1
	209	16	151	40	56	134
Eastern :						
Ulanga	42	16	5	—	46	20
	42	16	5	—	46	20
Lake :						
Biharamulo	41	7	53	7	48	5
Musoma	17	0	9	2	11	—
Mwanza	3	1	2	—	43	7
	61	8	64	9	102	12
Northern :						
Mbulu	48	15	15	5	38	5
	48	15	15	5	38	5
Southern :						
Kilwa (Liwale)	9	3	—	—	1	—
Lindi	1	1	—	—	—	—
Masasi	7	4	46	4	36	4
Songea	3	0	1	—	—	—
Tunduru	18	3	20	13	7	3
	38	11	67	17	44	7
Southern Highlands :						
Chunya	1	—	4	—	29	1
	1	—	4	—	29	1
Western :						
Buha	76	56	105	93	361	98
Kahama	98	29	84	550	230	48
Kigoma	1	1	22	1	7	2
Tabora	79	44	146	16	458	41
Ufipa	—	—	—	—	—	—
Mpanda	—	—	18	19	41	3
	254	130	375	679	1,097	192
Totals ...	653	196	681	750	1,412	371

Note.—These statistics are as accurate as possible, but after the Sleeping Sickness Officer's safaris various adjustments had to be made, and in any case mathematical accuracy is impossible.

109. There has been a considerable increase in the number of cases reported—notably in the Western Province. This trend became evident during the second half of the year, when steps were taken to review the position. A Medical Officer was seconded for special Sleeping Sickness duties in November, and a conference was held in Tabora on 12th December, which was attended by

Dr. H. M. Lester, Director of the East African Tsetse and Trypanosomiasis Research Organization, the Deputy Director of Medical Services, Provincial Commissioner, Western Province, Provincial Medical Officers, Central and Western Province, and Lake Province and other officers. This conference resulted in an intensification of measures for the location of Sleeping Sickness foci, and the gathering of information as to the percentage of infection in the population at risk.

110. The Provincial Medical Officer, Central and Western Provinces reports as follows :—

> "The total number of cases for the Territory for 1949 was 1,412 and deaths reported were 371. The number of deaths reported bears no relationship to the number of new cases. Any drive for follow-up results in reports of many deaths of patients who suffered from Sleeping Sickness years ago. There is little to indicate cause of death in many instances. Many Case Sheets dating from the late thirties and early forties have recently been sent in with the laconic remark written across them *Amekufa zamani.* This has happened particularly this year in the Central Province and explains the otherwise curious report of 56 cases and 134 deaths. It is also happening in Buha where a follow-up drive is now taking place.
>
> In order to get a picture at a glance of the position in the Territory as a whole and the Western Province in particular I have prepared a graph which indicates that the rise in incidence started about the middle of 1948. The graph also shows that Territorial Cases and Western Cases run fairly parallel, which is to be expected since Western Province produces a very high percentage of total cases. The peak of both was reached in November with a drop of about forty cases in December for the Territory and of about fifty cases for Western Province.
>
> In order to get a similar picture of the worst foci in the Western Province I have prepared graphs of cases for the past three years for Tabora, Mambali, Kitunda, Sikonge and Kakonko (Buha).
>
> (a) *Tabora and Mambali* (both described in Dr. Bell's report) may be, I think, regarded as one area. Tabora south, Mambali north, and the close parallelism of their graphs seems to confirm this. The rises in both in October and November followed intense combing of the areas by Scouts under the Settlement Officer, activity which continued in December with a gratifying decrease. One very serious result of this flare-up was the eastward spread of infection across the Tabora-Mwanza Railway line, first realized when the Station Master and various other railway employees at Nzubuka contracted the disease. That situation is now being dealt with by E.A.T.T.R. and R.O. at the highest level. The future of this area with regard to resettlement will have to be decided later. This particular area supplied by far the greatest number of cases of any in the Western Province as the graph would have shown more clearly if both parts of the area had been combined in one graph.
>
> (b) *Kitunda*—the graph illustrates clearly the little "flare-up" which occurred *west* of Kitunda towards the end of 1948, and which was promptly and adequately dealt with by the Settlement Officer with gratifying results. The sudden rise in November was mainly due to a

migration of sick people from an isolated area known as *Isanga* across the border in the Central Province, to the south-east of Kitunda. To anticipate next year's Annual Report, but in order to complete the present picture, this area has just been thoroughly surveyed by the Settlement Officer who did not succeed in finding a single further case. He was also able to trace eighty-nine persons who had migrated from Isanga to various other districts and to establish the fact that the main cause of migration was lack of food and a wish to be nearer trading centres, though sickness had played its part. For the present, therefore, there is no need for anxiety about this area.

(c) *Sikonge*—this shows a steady run of cases throughout all three years, with a rise towards the end of 1948, and continuing at a slightly higher level than usual during 1949. Sikonge is fly-free, but many inhabitants of the surrounding districts are honey-hunters and fishermen or fish traders. For many years this area has been "Sleeping Sickness Conscious" and the vast majority of the cases are occupational. There is nothing in the graph comparable to the steep rise in the "Tabora-Mambali" area, which produced a significant number of female cases.

(d) *Kakonko*—an alarming rise (forty-seven cases) occurred in August, 1949. Thereafter the number of cases dropped steadily until the end of the year, with only eight cases. I have plotted the figure for January (twenty cases) to indicate the result of intense activity by a Medical Officer, Settlement Officer, Scouts and a survey team of six microscopists. I think one can confidently foretell a decrease in this area.

BLOOD SURVEYS

(a) At the Conference in Tabora in December Dr. Lester stressed the necessity of fact-finding before starting any scheme for re-settlement, etc., and emphasized the possibility of humans carrying the infection without being sick, a possibility which, I think now, most of us East African workers had dismissed too lightly. Systematic surveys were therefore strongly advised. The Kakonko area was chosen for a start and a Medical Officer, a Settlement Officer and six trained microscopists were seconded to that work. The survey, after initial difficulties had been overcome, finally got going smoothly about the first week in January. By the first week in February, of a population of about 32,000, about 7,000 slides had been examined. As a result, four positive slides were found, of which one was found to be a case already under treatment at Nyaviumbu, one was a sick woman and two unsuspected. Simultaneously with the survey, scouts were active looking for sick people with the result that several new cases were found and several sick attended the dispensary voluntarily, producing sixteen more cases or a total for January of twenty, males ten and females ten, a significant figure. At the same time a vigorous "follow-up" was being made by the Medical Officer of the 1949 cases, and by the first week in February 142 of the 187 cases had been accounted for.

(b) Uncontrolled sliding has been carried on through the year in the Kahama area under the general direction of a Settlement Officer. A total of 27,277 blood-smears were examined. The total number of cases of Sleeping Sickness reported from the area for 1949 is 172, but no information is available as to how many of the cases discovered were the direct result of the sliding and how many voluntarily presented themselves because they were sick.

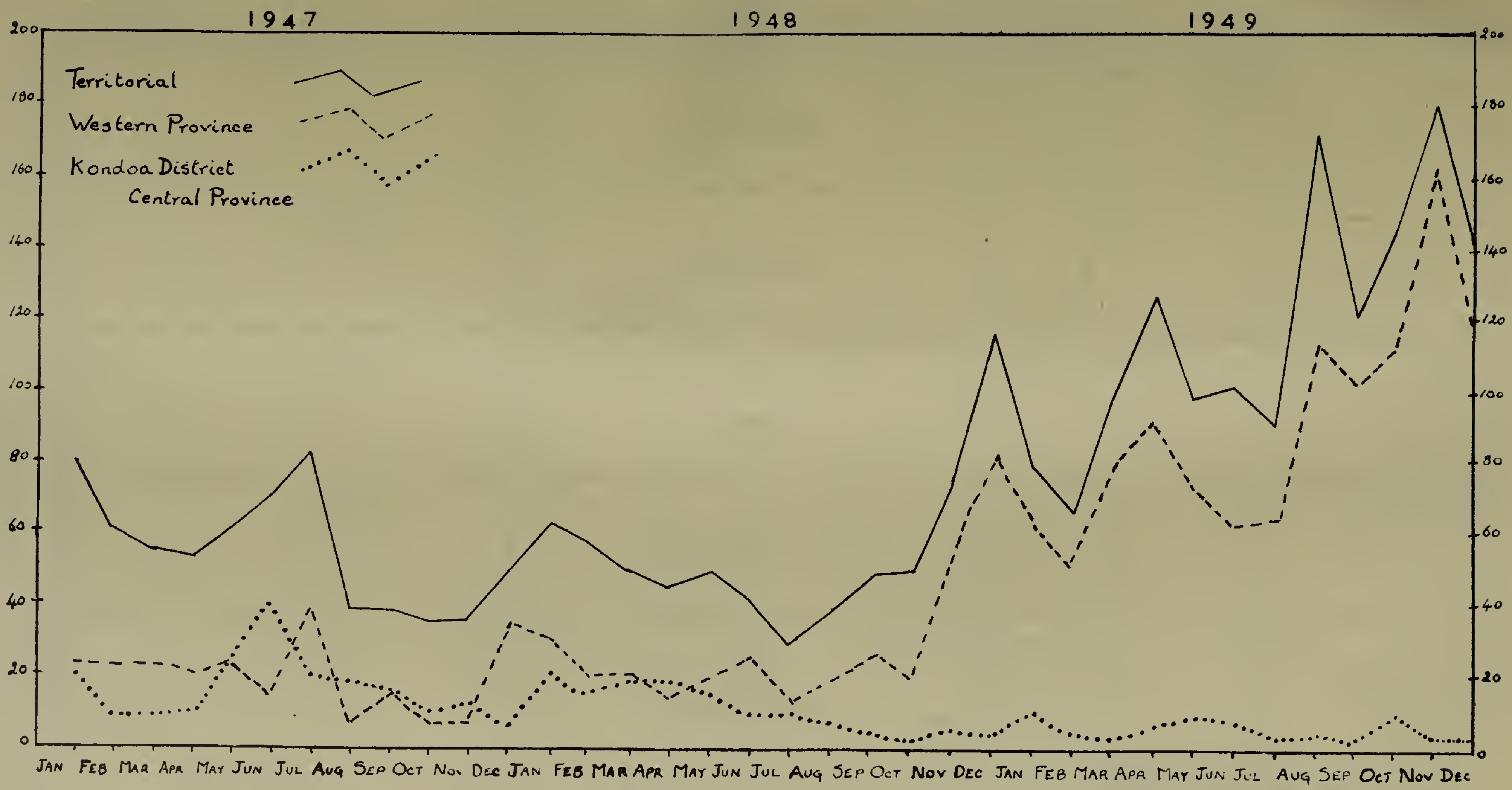
General Comments

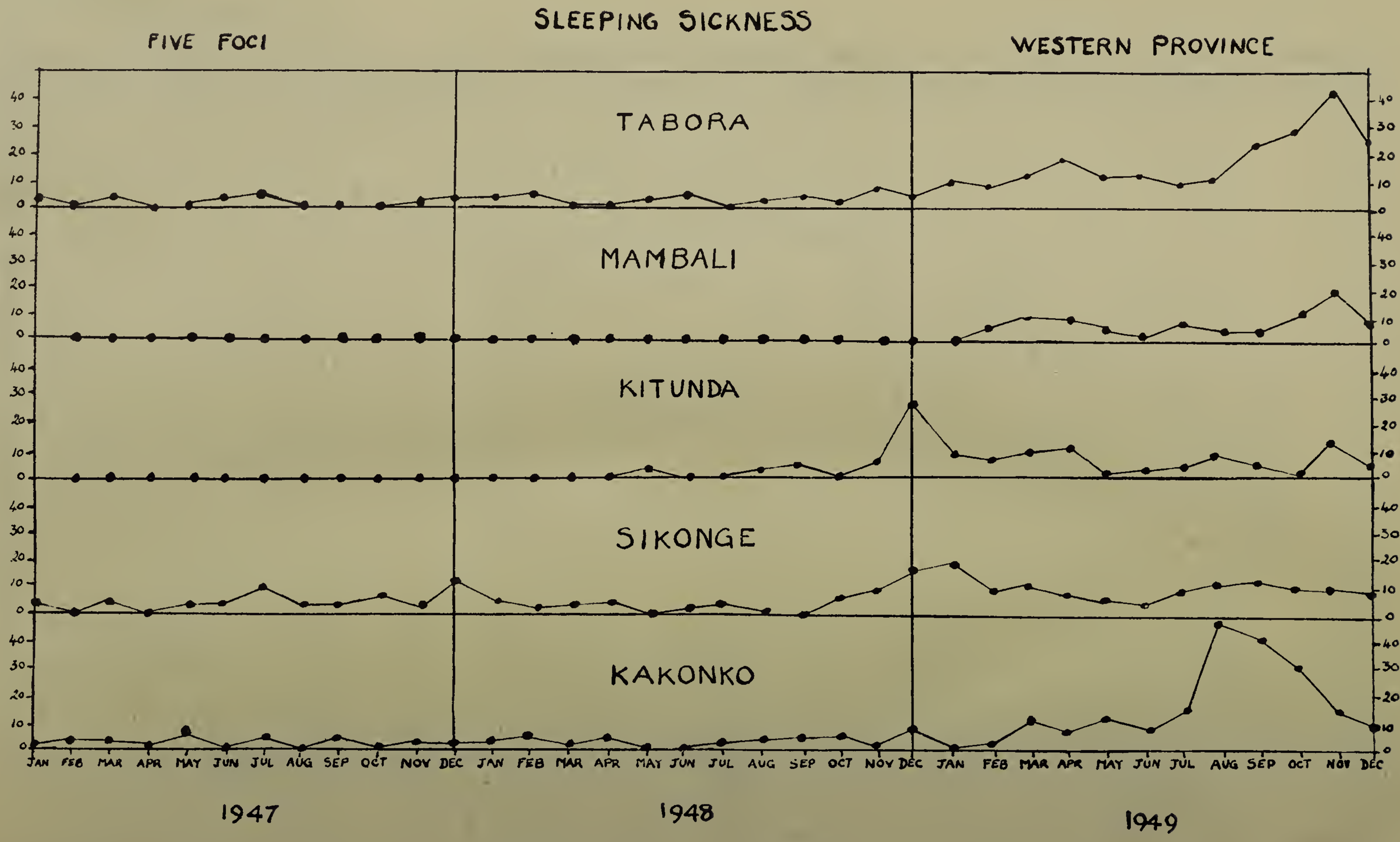
Much discussion has taken place from time to time as to the cause of the present "flare-up". I have heard it stated that the Trypanosomiasis Research Laboratory foretold a rise in 1949, but of that I have no evidence. Climatic conditions, especially the long hot period of the drought, have been cited as a most likely cause by raising the infectivity of the fly. In some areas fragmentation of the formerly closely settled concentrations has been blamed. Most probably a combination of several factors is responsible, including even malnutrition and food shortages. In November, 1949, Dr. H. M. Lester instructed Messrs. A. G. Robertson and P. E. Glover to survey the Tsetse Clearings of the Central Province. In Appendix 3 (Sleeping Sickness in the Kondoa District) to their report they write : 'From the above information and what we saw of the area it would appear that the anti-sleeping sickness campaign carried out from 1947 onwards is proving successful and that the efforts of the Settlement Officers are particularly worthy of praise. For although a large increase in Sleeping Sickness cases might have been expected this year, as has happened in the Western Province, there has been a marked decrease.' After reading this, as a matter of interest I plotted the Kondoa cases against the Territorial and Western cases. The graph shows that up to the middle of 1948 the case incidence ran closely parallel with both Territorial and Western incidence. But from mid 1948 the curves diverge, Kondoa showing a steady decline; Territorial and Western soaring. It is likely that most factors, hypothetical and real, such as climatic, food shortages, etc., were common to both Provinces, but some agent or factor beginning to exert an influence by mid 1948 caused this striking divergence of the graphs. The only known factor not common to both was the determined attack by the Settlement Officers.

There is cause for great satisfaction in the knowledge that future campaigns will have expert direction and the help and advice of the various organizations now under single control."

111. In the Lake Province the situation at Uzinza (West Mwanza), where there has been much uncontrolled immigration from central Sukumaland and many thousands of people are living in contact with tsetse fly, gave cause for concern, and the discovery of cases in the area at the end of June led to immediate action. All persons living in the infected area (about 500 in all) were removed and resettled in fly-free country; the operation being completed by the end of August. At the same time the whole position in Uzinza was reviewed, and a comprehensive aerial reconnaissance and partial aerial photographic survey was made with the co-operation of the Chief Civil Aviation Officer. The extent of dangerous settlement proved to be considerable, and while evacuation of the infected area has probably prevented wholesale spread of sleeping sickness throughout Uzinza, the situation must continue to be watched closely.

SLEEPING SICKNESS




SLEEPING SICKNESS
FIVE FOCI
WESTERN PROVINCE
TABORA
MAMBALI
KITUNDA
SIKONGE
KAKONKO
0
10
20
30
40
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1947
1948
1949

112. A reported outbreak of the disease in the Mori River area in North Mara was investigated by Dr. Mack of the Mennonite Mission, who found the report to have been based on faulty diagnosis, and in view of the greater apparent risk in West Mwanza and Biharamulo anti-sleeping sickness measures are being concentrated in the latter areas.

BUBONIC PLAGUE

113. Eighteen cases and fourteen deaths occurred in the Singida District. These represented the tail end of the 1948 epidemic, and no further cases have been reported.

POLIOMYELITIS

114. There are indications of the sporadic incidence of this disease in Tanganyika over an indefinite period, but no case was actually reported in the territory before 1945. Since that year there has been a steady increase in the recorded incidence, though this is probably due partly to a greater awareness of the presence of the disease. Sixty-three cases with six deaths were reported in 1949, the majority occurring in the Lindi and Mikindani areas of the Southern Province. It seems probable that the local outbreak in this area is a result of the unusual influx of population as "susceptibles", or consequent upon the development activities in that Province.

XV.—ENDEMIC DISEASES

LEPROSY

115. Extensive surveys by the Inter-Territorial Leprologist were carried out in the Southern Highlands Province and in the Lake Province. As a result, Dr. Ross Innes has estimated a leprosy incidence of 14·3 per 1,000 in the territory. The overall incidence may, however, be higher than this, since a survey has not yet been carried out in the Southern Province which is reported to have a high leprosy incidence.

116. The year has seen the introduction of the new drug, sulphetrone, in the campaign against this disease in Tanganyika. The drug is being issued free of charge to all qualified medical practitioners (including mission doctors) who are prepared to provide the requisite personal treatment control of leprosy patients.

117. *Malaria and Blackwater Fever*

	1945	1946	1947	1948	1949
Malaria :					
Out-patients ...	93,928	96,523	118,738	124,242	129,638
In-patients ...	10,778	10,631	13,962	13,796	11,567
Deaths (In-patients)...	183	192	264	264	261
Fatality per cent (In-patients)...	1·6	1·8	1·9	1·9	2·2
Blackwater Fever :					
Out-patients ...	13	10	8	—	27
In-patients ...	46	54	38	23	22
Deaths (In-patients)	13	9	12	5	7
Fatality per cent (In-patients)...	28·26	16·67	31·5	21·7	31·8

118. Despite the exceptionally dry weather this year there has been a small increase in the total number of cases of malaria treated. Indeed, in the Southern Highlands Province the Provincial Medical Officer considers

that the increased incidence in, for example, Mbeya where there is always much running water, may be due to the unusually warm and long dry season; the mean average temperature having been higher during the last two years.

119. An experiment was started in 1948 at the African Girls' School at Tabora, when paludrine (one tablet twice weekly) was issued to the children with remarkable success; no further cases of malaria occurring from February onwards throughout the year. In 1949 the method of administration was altered to two tablets once a week, and the same system was used at the Kazima School. The Provincial Medical Officer reports—"As 1949 was an exceptionally dry year the results may not be comparable. Certainly at Kazima the number reporting sick with malaria was vastly reduced, but at the girls' school the impression gained was that the results were not as good as when the doses were spaced." The boys and staff at the Government Boys' School, who were used as controls and received no prophylactic drug, showed a considerably higher malaria rate. It has been decided that in 1950 all pupils in the government boarding schools at Tabora and Kazima will receive three tablets of paludrine weekly (one every other day except weekends) in accordance with the Colonial Medical Research Committee's recommendation for immunes.

120. *Relapsing Fever*

	1945	1946	1947	1948	1949
Out-patients	2,998	3,844	3,605	3,004	2,552
In-patients...	1,815	1,926	1,694	1,223	2,036
Deaths (In-patients) ...	33	32	27	33	15
Fatality per cent (In-patients)	1·8	1·6	1·5	2·7	0·73

121. It is interesting to note that although there is an increase in the number of cases of relapsing fever reported this year, the fatality rate has decreased. The apparent increase in incidence is proportional throughout the territory, and there is no evidence of any localized outbreak or epidemic. Increasing numbers of African microscopists are becoming available to carry out routine blood examinations in cases of unexplained fever, and it seems likely that the apparent increase in incidence of relapsing fever is due simply to the fact that many more cases of the milder types of the disease are now being correctly diagnosed.

122. In the Central and Western Provinces all Townships and Minor Settlements have obtained supplies of gammexane and an attempt has been made to ensure that each house or room known or suspected to have produced a case of relapsing fever is treated. In Tabora, where the closest liaison between medical and sanitary authorities was established towards this end, 662 rooms were treated with gammexane during the year. That close supervision is required to ensure the effectiveness of even this simple treatment is evidenced by the fact that in one Minor Settlement the houses were found to be being diligently treated with diatomite diluent only, the gammexane having been overlooked and left in the store.

123. In the Lake Province a gammexane mixture was supplied to rural dispensaries in the Sukumaland area with a view to its use for propaganda purposes. The result has been disappointing, no popular demand having grown up as a result of the experiment.

124. *Schistosomiasis*

	1945	1946	1947	1948	1949
Out-patients	10,324	10,671	9,217	14,036	12,538
In-patients	474	672	620	723	778
Deaths (In-patients)	3	5	10	14	17
Fatality per cent (In-patients)	0·68	0·74	1·6	1·9	2·18

125. The number of recorded cases of schistosomiasis shows a decline from the 1948 incidence, but little significance can be placed on this fact since many persons suffering from the disease do not report for treatment. A small scale experiment in prevention initiated in the Same District (Kisiwani Village) in 1948 was continued into 1949. The methods used included designating and demarcating watering places, copper "sulphating" the Bulinus snail infested stream, and intensive propaganda. The District Commissioner, Same reported in May, 1949 "Some practical experience of the difficulties has been obtained; notably in regard to the apparent incapacity of the people concerned to afford the regular and willing co-operation which is necessary if the experiments are to succeed, and which their repeatedly declared desire to see the disease eradicated might lead one to expect". Unfortunately this remark could be repeated for many other areas where bilharzia infestation is prevalent. The prevailing attitude of the African when required to contribute actively towards preventing the "fouling of his own doorstep" is one of apathy and disinterest, although he is vocal enough in demanding it to be done for him. Constant, oft-repeated propaganda and intelligent supervision are of fundamental importance in any scheme of control, while the provision of unpolluted water supplies and sanitation are a *sine qua non* in prevention of this disease.

126. *Ankylostomiasis*

	1945	1946	1947	1948	1949
Out-patients	20,556	25,327	23,720	23,544	22,813
In-patients	2,113	2,509	2,633	2,746	2,458
Deaths (In-patients)	151	142	152	131	121
Fatality per cent (Inpatients)	7·15	5·65	5·77	4·77	4·90

127. The burden of sickness resulting from Ankylostomiasis and reflected in the territorial return of diseases for 1945-1949 continues at a high rate. It is evident, without recourse to consideration of the many allied factors which are conducive to the spread of ankylostomiasis that, taken by and large, the condition of the environmental hygiene and sanitation of the territory is far from satisfactory. It is readily realized that the figures of morbidity returns from this disease do not adequately reflect the true position, and that there are many more persons infested than ever appear at hospitals for treatment. Routine stool tests in 1949 of schoolboys in Tabora who did not complain of illness revealed an infestation rate with ankylostomiasis varying from fifteen per cent in the Government Secondary School (197 boys) to thirty per cent in the Government Town School (193 boys and fifty-one girls). It is the common experience of most medical officers in the territory that ankylostomiasis is responsible for much sub-standard health, or negative health as it is often termed, and as such constitutes a major economic problem, especially when present with such other "lowering" diseases as chronic malaria, bilharziasis and mal- or under-nutrition. The life cycle of the parasite

is known, the methods of radical cure, and prevention are available, and it only remains for the practical application of these methods to be brought into force by all persons interested in the care and welfare of the African, including the African himself.

128. *The Dysenteries*

	1945	1946	1947	1948	1949
Amœbic					
Out-patients	279	496	692	581	838
In-patients	171	254	259	254	249
Deaths (In-patients)	10	11	21	18	21
Fatality per cent (In-patients)	5·8	4·3	7·3	7·1	8·4
Bacillary					
Out-patients	674	550	603	690	780
In-patients	302	281	151	246	232
Deaths (In-patients)	32	31	16	18	11
Fatality per cent (In-patients)	10.6	11.03	10.6	7·3	4·7
Unclassified					
Out-patients	1,960	2,161	2,395	3,111	3,752
In-patients	544	457	295	593	490
Deaths (In-patients)	41	45	22	32	31
Fatality per cent (Inpatients)	7·5	9·6	7·5	5·4	6·3

129. Territorial figures as a whole show a rise over 1948 returns in th incidence of the dysenteries. Although it might be possible to apportion som blame for the rise on the partial failure of the rains during 1948-1949, thu leading to lowered standards of domestic and personal hygiene, the increase number of cases recorded is insufficiently significant to justify more tha conjecture. There have been no major epidemics of the dysenteries, but i Morogoro particularly gross pollution of the water supplies of Tungi sisal estates is thought to have been the cause of a minor outbreak commencing during the latter part of 1948, and continuing, but declining, during early 1949. Some attempt was made to identify the causal organism, but although *S. typhi*, *S. flexner* and *S. shigæ* were isolated, the results were inconclusive. Another small outbreak was reported from a sisal estate near Arusha during the year. This subsided rapidly without identification of the causal organism.

130. *The Enteric Fevers*

	1945	1946	1947	1948	1949
Out-patients	14	26	74	183	10
In-patients	203	302	291	282	326
Deaths (In-patients)	43	38	46	34	38
Fatality per cent (In-patients)	21·2	12·6	15·4	11·9	11·6

131. Here as in the case of dysenteries, it is possible to postulate adverse weather conditions as a contributory factor in the rise in the number of in-patients suffering from typhoid. Localized outbreaks occurred in Southern Province, and there was a continued rise in the number of cases recognized in Lindi Township where the water supply and sanitation continued to give cause for grave concern. Insufficient statistics are available to form a satisfactory estimate of the true incidence of the Enteric group of diseases. The fact remains that surface water supplies must be reckoned as polluted and for practical purposes the most probable sources of these infections. It follows that until the public and water supply authorities can be brought to recognize

that the supply of water alone is not enough for human consumption, but that the supply of a safe water is imperative, the preventable hazard of this group of diseases will continue to be a constant menace throughout this Territory. Disregard of this situation by the non-African population who should know better is something difficult to explain.

132. *Venereal Diseases and Yaws*

Syphilis	1945	1946	1947	1948	1949
Out-patients	38,614	... 37,486	... 38,897	... 37,539	... 36,492
In-patients...	1,705	... 1,868	... 2,364	... 1,943	... 1,823
Gonorrhoea					
Out-patients	15,699	... 16,928	... 20,050	... 21,493	... 17,606
In-patients...	2,982	... 2,864	... 2,414	... 2,523	... 2,317
Yaws					
Out-patients	68,446	... 50,284	... 60,052	... 61,263	... 61,147
In-patients...	644	... 975	... 714	... 685	... 676

133. The territorial incidence of the venereal diseases remains practically in *statu quo* while the facilities available for treatment are to all intents and purposes inadequate in quality and quantity. The various aspects of venereal disease control were reviewed at a meeting held in the Colonial Office on 3rd February, 1948, and from time to time the problem has been discussed at some length by various committees and bodies in this territory. From the accumulated mass of minutes and correspondence the consensus of opinion focuses on (i) the necessity to provide early treatment centres, (ii) the rendering of a case of venereal disease non-infective (iii) the need for formulating plans for the spread of venereal disease control information through every available responsible channel, (iv) the difficulties, in a territory of the size of Tanganyika with such meagre facilities, of endeavouring to adjust moral standards as a means of control, and (v) the contributory factors of increasing detribalization in certain areas, and the movement of labour to industry.

134. There is much conjecture as to the true incidence of the venereal diseases, but the truth is that it is not known with any accuracy, and to augment treatment centres without prior reliable statistics of venereal disease incidence savours rather of putting the cart before the horse. A more healthy approach to the problem would be a fact finding pilot scheme in a selected area, and firm proposals for a radical attack on the disease utilizing all the accepted bona fide modern methods of approach.

135. *Tuberculosis*

Pulmonary	1945	1946	1947	1948	1949
Out-patients	2,988	... 2,915	... 3,257	... 3,301	... 4,851
In-patients...	886	... 1,125	... 983	... 1,298	... 1,370
Deaths (In-patients) ...	134	... 199	... 226	... 228	... 268
Fatality Per cent (In-patients)	15·1	... 17·7	... 22·9	... 17·6	... 19·56
Non-Pulmonary					
Out-patients	1,832	... 1,461	... 1,731	... 1,710	... 672
In-patients...	308	... 332	... 296	... 671	... 348
Deaths (In-patients) ...	17	... 23	... 19	... 24	... 12
Fatality Per cent (In-patients)	5·5	... 6·9	... 6·4	... 3·5	... 3·39

136. A report of the work carried out by the Specialist Tuberculosis and by the staff of the Tuberculosis Hospital Sanatorium at Kibongoto appears at paragraphs 53 to 69.

137. *Pneumonia*

	1945	1946	1947	1948	1949
In-patients	3,903	3,996	3,606	4,575	4,723
Deaths	420	334	333	419	407
Fatality Per cent	10·7	8·3	9·17	9·16	8·62

138. There has again been an increase in the number of cases of pneumonia reported, and the disease continues to account for the largest number of deaths among patients in Government hospitals.

139. There was an outbreak of epidemic influenzal pneumonia during August at Kidodi in the Kilosa District, and by the end of September 151 cases and six deaths had been reported from the area. Remarkably satisfactory response was obtained with sulphonamide treatment. Good results with the use of procaine penicillin in the treatment of pneumonia cases in the Sewa Haji Hospital, Dar es Salaam, have been mentioned in paragraph 19.

XVI.—PRINCIPAL LETHAL DISEASES

140. *In-patients in Government Hospitals*

Disease	(1) Number of Cases	(2) Per cent Total Cases	(3) Number of Deaths	(4) Per cent Fatality of Disease
Malaria and Blackwater Fever	11,589	15·22	268	2·30
Pneumonia	4,723	6·20	407	8·62
Dysentery and Enteritis	2,950	3·86	231	7·83
Ankylostomiasis	2,458	3·23	121	4·10
Relapsing Fever	2,036	2·67	15	0·73
Pulmonary Tuberculosis	1,370	1·80	268	19·56
The Anæmias	638	0·82	82	12·85
Trypanosomiasis	499	0·64	37	8·21
Non-Pulmonary Tuberculosis	348	0·47	12	3·39
The Enteric Group	326	0·44	38	11·65
Cerebro-Spinal Meningitis	225	0·29	128	56·88
Smallpox	55	0·01	10	18·18
All Other Diseases	48,876	64·35	1,391	2·84

XVII.—MEDICAL STORES

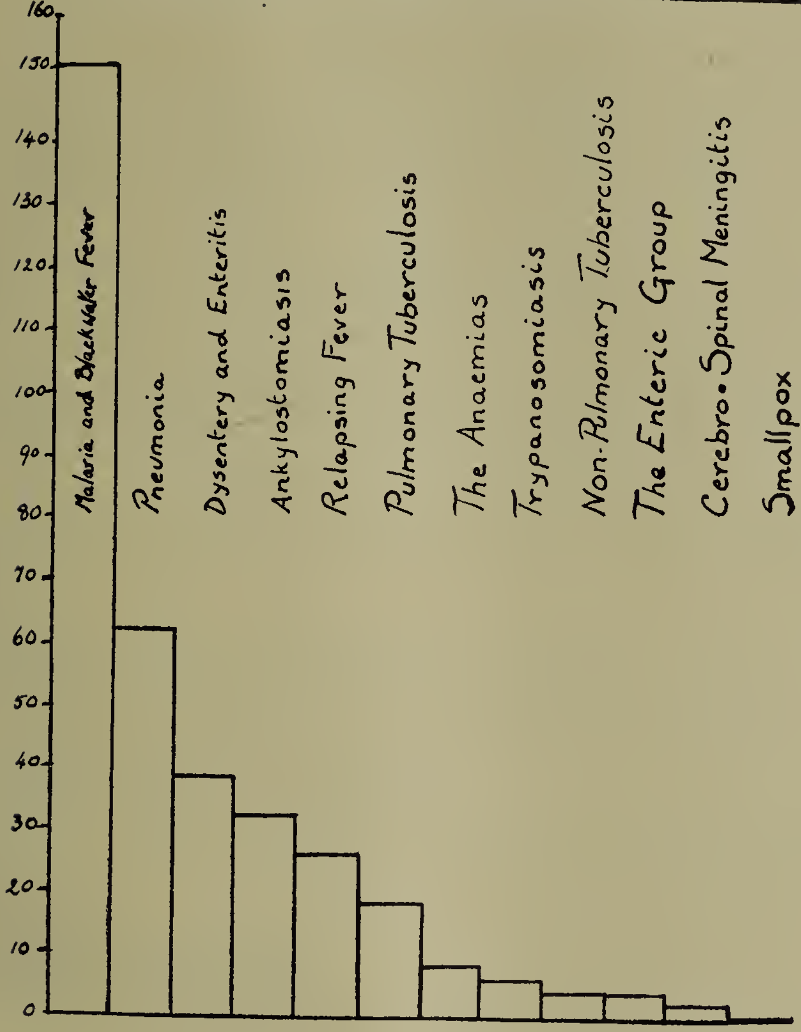
141. The Pharmacist reports some slight improvement in the rate of supply of equipment from overseas during the year. Great difficulty continued to be experienced, however, in obtaining supplies of dressings, although the position in this respect showed signs of improvement towards the end of the year.

142. The values of receipts and issues over the last three years have been as follows :—

	Receipts £	s.	cts.	Issues £	s.	cts.
1947	75,057	10	88	85,735	11	02
1948	103,386	14	35	100,362	19	96
1949	138,960	17	23	116,742	02	55

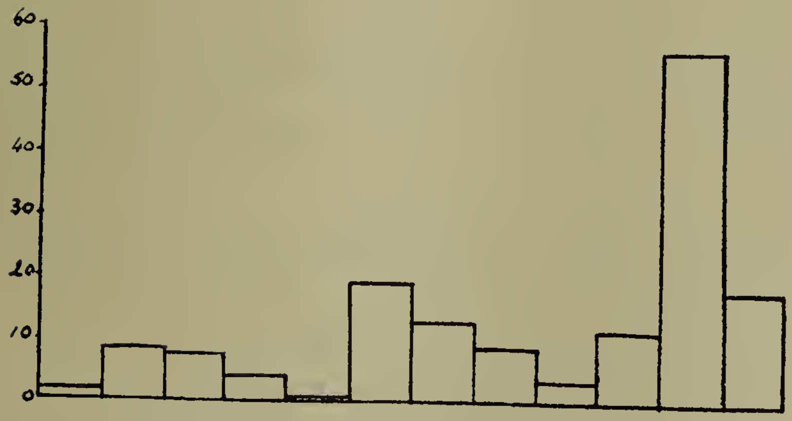
The value of stock on hand at 31st December, 1949, was £90,972 09s. 80c.

MORBIDITY AND CASE FATALITY



MORBIDITY RATE

Per 1,000 In-Patient Admissions



CASE FATALITY RATE

Disease Specific Fatality Rate per 100 Cases

Galenicals received from the Pharmaceutical Laboratory during the year were valued at £8,534 11s. 08c. compared with £8,994 02s. 04c. in 1948 and £7,025 14s. 31c. in 1947.

143. An indication of the increase in turnover is obtained from the fact that 4,972 rail packages, 2,174 postal packages and 2,442 local packages were despatched from the Stores during 1949, as compared with 4,367 rail packages, 1,119 postal packages and 2,248 local packages during 1948. 7,326 Issue Vouchers were prepared as compared with 6,277 in 1948.

144. Mr. H. M. W. Nicholson proceeded on leave to the United Kingdom in November, and Mr. P. J. Mackenzie has taken over his duties as Acting Pharmacist. A Stores Accountant, Mr. C. F. Bonavia was appointed in December, and an Assistant Pharmacist was posted to the Department in September and is employed in the Sewa Haji Hospital, Dar es Salaam.

145. XVIII.—NEW LEGISLATION

The Development Areas (Control) Ordinance, 1949 (Ordinance No. 21 of 1949).

The Master and Native Servants (Powers and Duties of Officers) Rules, 1949 (Government Notice No. 31 of 1949).

The Master and Native Servants (Contractors) Regulations, 1949 (Government Notice No. 67 of 1949).

The Minimum Wage Regulations, 1949 (Government Notice No. 77 of 1949).

The Workmen's Compensation (Rules of Court) Rules, 1949 (Government Notice No. 80 of 1949).

The Workmen's Compensation Regulations, 1948 (Government Notice No. 110 of 1949).

The Births (Non-Native Compulsory Registration) Order, 1949 (Government Notice No. 174 of 1949).

The Food and Drugs (Application) Order, 1949 (Government Notice No. 249 of 1949). *(By this Order the Food and Drugs Ordinance was made applicable to the whole of the Territory).*

The Extermination of Mosquitoes (Application) (Amendment) (Moshi Township) Order, 1949 (Government Notice No. 259 of 1949).

The Township (Amendment) (No. 2) Rules, 1949 (Government Notice No. 281 of 1949).

The Infectious Disease (Declaration of Infected Area : Western Province) Order, 1949 (Government Notice No. 283 of 1949).

146. XIX.—PUBLICATIONS BY MEMBERS OF THE STAFF

A. C. E. Cole.—"Poliomyelitis, Notes on Three Cases." *East African Medical Journal, Vol.* XXVI, *No.* 1.

M. G. Panvalkar.—"Perforation of a Typhoid Ulcer in a Hernial Sec." *East African Medical Journal, Vol.* XXVI, *No.* 1.

J. Ross Innes.—"Leprosy in Tanganyika; A survey of the Lake Province." *East African Medical Journal, Vol.* XXVI, *No.* 7.

J. Ross Innes.—"Leprosy in Tanganyika; A Survey in the Southern Highlands Province." *East African Medical Journal, Vol.* XXVI, *No.* 8.

D. Bagster Wilson.—"Malaria in British Somaliland." *East African Medical Journal, Vol.* XXVI, *No.* 10.

D. Bagster Wilson.—"Commentary on a Malaria Survey of Machakos District by J. C. J. Gallanan." *East African Medical Journal, Vol.* XXVI, *No.* 12.

D. Bagster Wilson.—"On the present and future Malaria Outlook in East Africa." *East African Medical Journal, Vol.* XXVI, *No.* 12.

A. W. Williams and J. P. Mackey.—"Rapid determination of the Sickle Cell Trait by the use of a Reducing Agent." *Journal of Clinical Pathology, May*, 1949, *Vol.* 2, *No.* 2.

Dar es Salaam,
June, 1950.

P. A. T. Sneath,
Director of Medical Services

TABLE 1—ESTABLISHMENT

Posts	ESTABLISHMENT			Strength 31st Dec. 1949			Remarks
	Senior Service	Junior Service	Sub-ordinate Service	Senior Service	Junior Service	Sub-ordinate Service	
I—Headquarters and Administrative							
1. Director of Medical Services, Deputy Director, Assistant Director and Senior Medical Officers	11	—	—	7	—	—	
2. Secretary	1	—	—	1	—	—	
3. Matron-in-Chief	1	—	—	1	—	—	
4. Chief Office Superintendent ...	1	—	—	2	—	—	
5. Stenographers, Librarian, Office Assistants, Clerks and Telephone Operators	3	88	49	3	63	63	
II—Stores and Pharmaceutical Services							
1. Pharmacist and Assistant Pharmacists	6	—	—	6	—	—	
2. Stores Accountant and Stores Assistants	1	9	1	1	4	—	
III—Hospital and Health Services							
1. Specialists, Medical Officers, Medical Officers of Health, Women and Temporary Medical Officers	60	—	—	52	—	—	Note Item J.1.
2. Matrons, Nursing Sisters, Sister Tutors and Male Nurses ...	74	—	—	64	—	—	Note Item J.1.
3. Physiotherapists and Physiotherapists Assistants	3	—	4	3	—	—	
4. Senior Assistant Surgeons, Assistant Surgeons, Senior Sub-Assistant Surgeons, Sub-Assistant Surgeons and African Assistant Medical Officers	—	72	—	—	63	—	
5. Assistant Nurses, Nursing Auxiliaries	—	73	—	—	59	—	
6. Woman Nutrition Officer and Nutrition Orderlies	1	—	3	1	—	—	
7. Hospital Assistants	—	120	—	—	104	—	
8. Senior Compounders, Compounders and Pharmaceutical Assistants	—	20	—	—	18	—	
9. Hospital Administration: Superintendent, Sister Housekeeper, Stewards, Secretary, Motor Drivers and Mechanics ...	6	22	17	6	15	11	
10. Chief Health Inspector, Senior Health Inspectors, Health Inspectors and Assistant Health Inspector	35	1	—	23	1	—	
11. Health Visitors	16	—	—	10	—	—	
12. Sanitary Inspectors	—	101	36	—	66	41	
IV—Specialist Services							
A. Dental.							
1. Senior Dental Surgeon and Dental Surgeons	5	—	—	3	—	—	
2. Dental Mechanics and Dental Assistants	2	7	—	3	—	—	
B. Leprosy.							
1. Specialist (Inter-Territorial) ...	1	—	—	1	—	—	
2. Temporary Medical Officer ...	1	—	—	1	—	—	

TABLE 1—ESTABLISHMENT (*contd.*)

Posts	ESTABLISHMENT			Strength 31st Dec. 1949			Remarks
	Senior Service	Junior Service	Sub-ordinate Service	Senior Service	Junior Service	Sub-ordinate Service	
C. Malaria.							
1. Specialist (Inter-Territorial) ...	1	—	—	1	—	—	
2. Temporary Medical Officer ...	1	—	—	—	—	—	
3. Biologist	1	—	—	1	—	—	
4. Malaria Field Assistants, Supervisors Anti Mosquito Measures and Malaria Assistants ...	3	17	10	2	10	15	
5. Laboratory Assistants	—	1	1	—	2	1	
6. Draughtsmen	—	1	—	—	1	—	
D. Mental.							
1. Specialist	1	—	—	1	—	—	
2. Chief Male Mental Nurse, Male and Female Nurse and Male and Female Nurses	8	3	—	7	2	—	
3. Handicraft Instructor	—	1	—	—	1	—	
E. Tuberculosis.							
1. Specialist	1	—	—	1	—	—	
2. Industrial Instructor	1	—	—	1	—	—	
3. Nurse	1	—	—	1	—	—	
F. Sleeping Sickness.							
1. Specialist	1	—	—	—	—	—	
G. Laboratory Services.							
1. Senior Pathologist, Pathologist and Biologist	3	—	—	3	—	—	
2. Laboratory Superintendents and Laboratory Assistants ...	3	27	—	2	23	—	
3. Microscopists	—	—	25	—	—	23	
H. X-Ray.							
1. Radiologist	1	—	—	—	—	—	
2. Radiological Technician ...	1	—	—	1	—	—	
3. Radiographer and Radiographic Assistant	1	1	—	—	1	—	
J. Medical Education							Seconded to special duty:- 2 Medical Officers Item III. 1. 2 Sister Tutors Item III. 2.
1. Medical Instructor	1	—	—	1	—	—	
Totals ...	257	564	146	210	433	154	

Deficiencies:—Senior Service—47
Junior Service } 123
Subord. ,, }

TABLE 2—NEWLY APPOINTED OFFICERS ARRIVED DURING 1949

Name	Appointment	Date of Arrival	Remarks
Dr. D. R. Conacher	Medical Officer	23.1.49	
Dr. J. D. B. Perkins	Medical Officer	11.3.49	
Dr. J. C. G. Lockyer	Medical Officer	1.5.49	
Dr. T. W. Robson	Medical Officer	7.5.49	
Dr. L. F. B. Delany	Medical Officer	7.5.49	
Dr. W. R. G. Thomas	Medical Officer	17.5.49	
Dr. G. Skinner	Medical Officer	8.9.49	
Dr. A. F. Fowler	Medical Officer	11.9.49	On Transfer from Gold Coast.
Dr. D. F. Clyde	Medical Officer	4.10.49	
Dr. K. J. Covell	Medical Officer	10.10.49	
Dr. G. M. Balletto	Medical Officer	18.10.49	On Contract.
Col. A. V. Lopes, I.M.S. (Retd.)	Medical Officer	1.11.49	On Contract.
Dr. F. Vivarelli	Biologist	4.6.49	On Contract.
Mr. W. J. Banham	Superintendent of Hospitals	1.1.49	
Mr. G. Reid	Health Inspector	30.7.49	
Mr. J. S. Stafford	Health Inspector	1.10.49	
Mr. N. H. Lloyd	Health Inspector	14.10.49	
Mr. J. Storey	Health Inspector	28.10.49	
Mr. W. E. B. Tanner	Health Inspector	1.12.49	
Mr. J. W. Baxendale	Health Inspector	11.12.49	
Mr. E. A. W. Lewis	Chief Office Superintendent	15.8.49	On Transfer from Labour Dept.
Mr. C. F. Bonavia	Stores Accountant	15.9.49	On Transfer from E.A. Development
Mr. W. F. Tagg	Dental Mechanic	13.5.49	
Mr. W. G. Rogers	Male Nurse	22.6.49	
Miss A. J. Stroud	Assistant Pharmacist	1.9.49	
Miss C. M. Copeman	Physiotherapist	5.5.49	
Miss E. R. Smith	Physiotherapist	15.12.49	
Miss M. A. Steel	Mental Nurse	11.3.49	
Mr. H. G. Bilcliffe	Malaria Field Assistant	2.7.49	

15 Nursing Sisters and 10 Health Visitors arrived for duty during the year.

TABLE 3—PROMOTIONS AND APPOINTMENTS

Name	From	To	Effective Date
Dr. K. Edmundson	A.D.M.S.	D.D.M.S.	8.4.49
Dr. A. C. E. Cole	Medical Officer	Specialist	17.5.49
Dr. A. J. Keevill, M.B.E.	Medical Officer	Senior Medical Officer	4.9.49

TABLE 4—HONOURS

G. R. C. Wilson, Senior Medical Officer—O.B.E.
Miss G. R. Ibbs, Matron—M.B.E.
Mzee Boko, African Male Nursing Auxiliary—King's Certificate of Honour and Badge.
T. J. de Souza, Office Assistant—B.E.M. (Military Division).

TABLE 5—ACTING APPOINTMENTS AND REVERSIONS

Name	Substantive Appointment	Acting Appointment	Effective Date	Date of Reversion
Dr. G. A. Macgregor	S.M.O.	A.D.M.S.	6.12.48	24.9.49
Dr. D. A. Skan, M.B.E.	Senior Pathologist	A.D.M.S. whilst continuing the duties of Senior Pathologist	24.9.49	—
Dr. H. Ehrlich	Medical Officer	S.M.O.	1.1.48	1.1.49
Dr. A. G. Farr	Medical Officer	S.M.O.	28.3.49	—
Dr. J. F. Lucey	Medical Officer	S.M.O.	29.3.49	—
Dr. F. Bell	Medical Officer	S.M.O.	9.11.48	4.9.49
Col. A. V. Lopes	Medical Officer	S.M.O.	22.11.49	—
Mr. P. J. Mackenzie	Assistant Pharmacist	Pharmacist	22.11.49	—
Miss G. R. Ibbs, M.B.E.	Matron, Grade I	Matron-in-Chief	23.12.48	11.7.49

TABLE 6—RETIREMENTS, TRANSFERS, ETC.

Name	Appointment	Date of Leaving Tanganyika	Remarks
Dr. A. McKenzie	D.D.M.S.	8.10.48	Leave pending retirement
Mr. A. H. Morley	Specialist	26.12.49	Leave pending retirement
Dr. A. W. Williams	Specialist	17.5.49	Transferred to Uganda.
Dr. E. J. Foley	Specialist	3.10.49	Leave pending retirement
Dr. A. V. Clemmey	Specialist	9.4.49	Leave pending resignation.
Dr. J. H. McDonald	Senior Medical Officer	30.10.49	Leave pending retirement
Dr. J. C. Bryce	Medical Officer	5.4.49	Leave pending resignation.
Dr. F. Bell	Medical Officer	24.11.49	Transferred to Kenya.
Dr. G. R. C. Wilson	Temporary Medical Officer	29.3.49	Retirement.
Dr. (Mrs.) M. E. Wilson	Temporary Woman Medical Officer	7.10.49	Resignation.
Mr. I. S. Rutter	Dental Surgeon	11.4.49	Leave pending retirement
Mr. S. Anderberg	Dental Mechanic	16.4.49	Leave pending retirement
Mr. R. C. Telling	Laboratory Superintendent	31.8.49	Leave pending resignation.
Mr. W. J. Baxendale	Health Inspector	25.12.49	Leave pending resignation.
Miss G. R. Ibbs, M.B.E.	Matron, Grade I	13.11.49	Leave pending retirement
Mr. G. Smith	Male Mental Nurse	3.11.49	Leave pending resignation.
Miss E. M. Brooks	Female Mental Nurse	14.10.49	Leave pending resignation.
Miss H. M. Dewey	Nutrition Officer	24.11.49	Leave pending resignation.
Mr. W. A. Hughes	Chief Office Superintendent	19.9.49	Leave pending retirement
Mr. C. H. Cook	Stores Accountant	15.9.49	Leave pending retirement
Miss E. D. Terry	Woman Administrative Assistant	19.8.49	Leave pending resignation.
Mr. J. Johnson	Night Superintendent	19.11.49	Termination of appointment.

Sixteen Nursing Sisters and Health Visitors left the Service during the year.

TABLE 7—MEDICAL AND DENTAL PRACTITIONERS RESIDENT ON 31st DECEMBER, 1949

PROVINCE	GOVERNMENT SERVICE					NON-GOVERNMENT							
	European	Asian	African	R. or L.		European	Asian	R. or L.		M.	PP.	I.	RC.
Central	1	5	—	1	5	27+1D	1	27+1D	1	6	2	20+1D	—
Eastern	16+2D	8	3	16+2D	11	19+3D	16	33+3D	2	3	30+3D	2	—
Lake	8	7	2	9	8	8	4	11	1	5	3	4	—
Northern	8	7	—	9	6	9+2D	2	10+2D	1	1	8+2D	1	1
Southern	2	5	—	4	3	11+1D	2	11+1D	2	6	1	6+1D	—
Southern Highlands	5	3	1	5	4	8	1	7	2	1	4	4	—
Tanga	8	10	—	10+1D	8	16+1D	4	16+1D	4	3	9+1D	8	—
Western	4	6	2	6	6	6+1D	1	7+1D	—	2	1+1D	4	—
Total ...	52+3D	51	8	60+3D	51	104+9D	31	122+9D	13	27	58+7D	49+2D	1

R—Registered.
L—Licensed.
M—Mission.

PP—Private Practice.
I—Employed in Industry.
RC—Refugee Camp.

TABLE 8—NUMBER OF BEDS AT 31st DECEMBER, 1949

Government Hospitals and Other Medical Centres, including Special Hospitals and Maternity and Child Welfare Clinics

Province	European	Asian	African	Total
Central	10	26	464	500
Eastern	54 8 cots	55	860	969
Lake	11	22	573	606
Northern	25	25	615	665
Southern	5	6	243	254
Southern Highlands	22	13	314	349
Tanga	18	19	741	778
Western	9	10	376	395
Totals	154	176	4,186	4,516

TABLE 9—IN-PATIENTS IN GOVERNMENT HOSPITALS

Excluding Special Hospitals and Maternity and Child Welfare Clinics

Province	No. admitted during year					No. discharged during year					Deaths					Daily average in Hospital				
	European		Non-European		Total	European		Non-European		Total	European		Non-European		Total	European		Non-European		Total
	M	F	M	F		M	F	M	F		M	F	M	F		M	F	M	F	
CENTRAL	–	–	4,217	1,437	5,654	–	–	4,044	1,361	5,405	–	–	124	62	186	–	–	143·00	44·86	187·86
EASTERN	482	359	10,587	2,783	14,211	472	355	10,223	2,661	13,711	12	2	413	147	574	13·17	8·29	461·21	116·38	599·05
LAKE	69	42	7,897	4,206	12,214	67	44	7,684	4,093	11,888	1	–	243	122	365	0·61	0·45	306·62	121·88	429·56
NORTHERN	207	259	8,190	3,361	12,017	201	259	7,822	3,178	11,460	8	2	406	153	569	4·46	4·62	367·37	182·35	558·80
SOUTHERN	56	10	2,340	640	3,046	57	10	2,280	610	2,957	–	–	87	23	110	0·62	0·26	122·33	34·26	157·47
SOUTHERN HIGHLANDS	130	130	4,265	3,132	7,657	129	127	4,093	3,018	7,367	6	1	160	108	275	3·04	3·14	160·79	96·14	263·11
TANGA	133	124	7,321	1,624	9,202	135	121	6,838	1,545	8,639	2	1	433	76	512	2·60	4·03	380·50	70·82	457·95
WESTERN	80	48	4,906	2,058	7,092	78	49	4,627	1,932	6,686	1	–	241	110	352	1·20	1·30	184·10	85·80	272·40
TOTALS	1,157	972	49,723	19,241	71,093	1,139	965	47,611	18,398	68,113	30	6	2,107	801	2,944	25·70	22·09	2,125·92	752·49	2,926·20

TABLE 10—OUT-PATENTS—GOVERNMENT HOSPITALS

Excluding Special Hospitals and Maternity and Child Welfare Clinics

Province	Total Attendances during the Year					Daily Average of Attendances				
	Europeans		Non-Europeans		Total	Europeans		Non-Europeans		Total
	Males	Females	Males	Females		Males	Females	Males	Females	
Central	1,157	867	128,710	58,798	189,532	3·10	2·20	352·40	161·10	518·80
Eastern	3,746	2,708	309,917	95,943	412,314	10·26	7·44	851·66	262·97	1,132·33
Lake	1,210	812	217,536	133,305	352,863	3·31	2·22	595·99	364·39	965·91
Northern	7,147	1,987	193,056	76,918	279,108	19·58	5·44	473·37	160·27	658·66
Southern	711	180	114,681	53,379	168,951	1·94	0·47	314·15	146·15	462·71
Southern Highlands	1,198	872	129,250	101,911	233,231	3·30	2·36	354·24	279·32	639·22
Tanga	1,329	980	122,388	64,450	189,147	3·56	2·67	335·30	176·57	518·10
Western	656	341	119,472	85,189	205,658	1·80	0·90	327·50	233·20	563·40
Totals	17,154	8,747	1,335,010	669,893	2,030,804	46·85	23·70	3,604·61	1,783·97	5,459·13

Province	Total New Cases during the Year					Daily Average of New Cases				
	Europeans		Non-Europeans		Total	Europeans		Non-Europeans		Total
	Males	Females	Males	Females		Males	Females	Males	Females	
Central	419	339	54,866	32,013	87,637	1·10	0·80	150·20	87·50	239·60
Eastern	2,663	1,857	108,148	45,523	158,191	7·28	5·07	296·38	124·72	433·45
Lake	583	329	111,478	68,427	180,817	1·59	0·90	305·42	287·47	595·38
Northern	1,402	968	80,437	44,861	127,668	3·88	2·70	220·36	122·90	349·84
Southern	524	115	53,951	24,827	79,417	1·42	0·31	147·79	68·01	217·53
Southern Highlands	685	608	64,509	49,372	115,174	1·83	1·63	173·94	132·52	309·92
Tanga	976	771	62,860	29,960	94.567	2·61	2·07	171·70	82·14	258·52
Western	357	190	80,828	57,438	138,813	0·90	0·50	221·40	157·30	380·10
Totals	7,609	5,177	617,077	352,421	982,284	20·61	13·98	1,687·19	1,062·56	2,784·34

In- and Out-Patients—Government Hospitals and Dispensaries
(Excluding Mental Hospitals and Maternity and Child Welfare Clinics)

DISEASES	Cases In-Patients	Deaths In-Patients	Cases Out-Patients	Total Cases In- and Out-Patients	Group Totals		Percentage of Group to Total Cases	Percentage of Group to Total Deaths
					Cases	Deaths		
Group I.—Infective and Parasitic Diseases								
Typhoid and Paratyphoid Fevers	326	38	10	336				
Plague	–	–	–	–				
Undulant Fever	10	2	18	28				
Cerebro-Spinal Meningitis	225	128	20	245				
Malignant Pustule and Anthrax	250	18	353	603	(a) Blood Inoculation Group			
Tuberculosis of the Respiratory System	1,370	267	4,851	6,221	146,723	318	13·78	10·80
Other forms of Tuberculosis :								
(a) Bones and Joints	109	6	215	324				
(b) Glands and Intestines	239	6	457	696				
Leprosy	236	14	356	592	(b) Intestinal and Excremental Group			
Dysentery : (a) Amœbic	269	21	569	838				
(b) Bacillary	259	11	521	780	73,397	263	6·89	8·93
(c) Undefined	503	31	3,249	3,752				
Malaria : (a) Benign Tertian	68	–	180	248				
(b) Quartan	78	3	282	360				
(c) Subtertian	6,983	192	54,900	61,883	(c) Surface Inoculation and Droplet Infection Group			
(d) Undefined	4,407	64	74,276	78,683				
(e) Blackwater Fever	22	7	27	49				
Trypanosomiasis	498	37	423	921	130,882	476	12·29	16·17
Venereal Diseases : (a) Syphilis	1,813	24	36,492	38,315				
(b) Gonorrhœa	2,317	7	17,606	19,923				
(c) Other Venereal Diseases ...	350	7	2,299	2,649	(d) Other Infectious and Protozoal Diseases			
Relapsing Fever	2,027	15	2,552	4,579				
Yaws	676	7	61,147	61,823				
Smallpox	55	10	39	94	11,368	87	1·07	2·96
Ankylostomiasis	2,458	121	22,813	25,271				
Schistosomiasis	778	17	12,538	13,316				
Other Helminthic Diseases	657	22	28,462	29,119				
Other Infective or Parasitic Diseases	1,668	69	9,054	10,722	362,370	1,144	34·03	38·86
Group II.—Cancer and Other Tumours								
Cancer of the Liver and Biliary Passages	46	18	16	62				
Other Malignant Tumours	207	30	44	251				
Non-Malignant Tumours	299	6	235	534				
Unspecified Tumours	167	7	336	503	1,350	61	0·13	2·07

TABLE 11—GENERAL DISEASES—*contd.*

In- and Out-Patients—Government Hospitals and Dispensaries

(Excluding Mental Hospitals and Maternity and Child Welfare Clinics)

DISEASES	Cases In-Patients	Deaths In-Patients	Cases Out-Patients	Total Cases In- and Out-Patients	Group Totals		Percentage of Group to Total Cases	Percentage of Group to Total Deaths
					Cases	Deaths		
Group III.—Nutritional, Glandular and General Diseases								
Rheumatic Conditions	753	4	30,569	31,322				
Diabetes	27	1	47	74				
Diseases of the Endocrine Glands	35	2	134	169				
Scurvy	16	3	34	50				
Beriberi	14	2	23	37				
Pellagra	4	–	243	247				
Other Deficiency Diseases	221	15	2,338	2,559	34,458	27	3·24	0·92
Group IV.—Diseases of the Blood and Blood-forming Organs								
Anæmias : (a) Hyperchromic	172	39	691	863				
(b) Hypochromic	465	40	5,264	5,729				
Other Diseases of the Blood and Blood-forming Organs	238	24	3,772	4,010	10,602	103	1·00	3·50
Group V.—Acute and Chronic Poisoning	65	4	10	75	75	4	0·01	0·14
Group VI.—Diseases of the Nervous System and Sense Organs								
Mental Diseases	85	1	75	160				
Trachoma	101	–	1,015	1,116				
Other Diseases of Vision	1,306	–	56,352	57,658				
Diseases of the Ear and Mastoid	231	4	16,592	16,823				
Other Diseases of the Nervous System	741	74	19,529	20,274	96,031	79	9·02	2·68
Group VII.—Diseases of the Circulatory System								
Heart Disease	285	78	504	789				
Other Diseases of the Circulatory System	258	35	2,002	2,260	3,049	113	0·29	3·84
Group VIII.—Diseases of the Respiratory System								
Bronchitis	1,595	15	92,448	94,043				
Pneumonia	4,722	407	2,559	7,281				
Other Diseases of the Respiratory System	1,135	38	37,340	38,475	139,799	460	13·13	15·63
Group IX.—Diseases of the Digestive System								
Diarrhœa and Enteritis : (a) under 2 years	313	37	8,889	9,202				
(b) 2 years and over ...	1,606	131	18,969	20,575				
Hernia, Intestinal Obstruction	1,113	74	675	1,788				

(Excluding Mental Hospitals and Maternity and Child Welfare Clinics)

DISEASES	Cases In-Patients	Deaths In-Patients	Cases Out-Patients	Total Cases In- and Out-Patients	Group Totals		Percentage of Group to Total Cases	Percentage of Group to Total Deaths
					Cases	Deaths		
Group X.—Diseases of the Urinary and Genital Systems								
(Not Venereal or connected with Pregnancy or the puerperium)								
Diseases of the Kidney, Ureter and Bladder	516	54	2,718	3,234				
Diseases of the Male Genital Organs	1,951	17	3,599	5,550				
Diseases of the Female Genital Organs	796	7	3,684	4,480	13,264	78	1·24	2·65
Group XI.—Diseases of Pregnancy								
Deliveries	2,934	42	156	3,090				
Abortions and Miscarriages	543	7	140	683				
Toxæmias of Pregnancy	165	17	807	972				
Other Conditions of the Puerperal State	507	26	1,447	1,954	6,699	92	0·63	3·12
Group XII.—Diseases of the Skin and Cellular Tissue								
Ulcers	6,145	42	92,134	98,279				
Other Skin Conditions	3,502	34	44,150	47,652	145,931	76	13·71	2·58
Group XIII.—Diseases of the Bones and Organs of Locomotion								
Diseases of Bones, etc. (excluding T.B.)	1,242	5	16,024	17,266	17,266	5	1·62	0·17
Groups XIV and XV.—Congenital Malformations and Diseases Peculiar to the First Year of Life								
Malformations, Premature Birth, and Injury at Birth ...	25	6	25	50				
Congenital Debility	33	21	188	221				
Diseases Peculiar to the First Year of Life	32	8	101	133	404	35	0·04	1·19
Group XVI.—Senility and Old Age	73	22	82	155	155	22	0·01	0·75
Group XVII.—Violence and External Causes								
Suicide	119	1	697	816				
Homicide	698	28	8,475	9,173				
Accidents	6,632	193	54,504	61,136	71,125	222	6·68	7·54
Group XVIII.—Ill-defined Causes	1,670	50	8,169	9,839	9,839	50	0·92	1·69
Totals ...	74,981	2,944	989,687	1,064,668	1,064,668	2,944	100·00	100·00

TABLE 12—MATERNITY AND CHILD WELFARE SERVICES

A.—Government Maternity and Child Welfare Clinics

PROVINCE	Total Confinements Attended	Normal Deliveries	Miscarriages and Abortions	Abnormal Deliveries	Live Births	Still Births	Deaths of Mothers	Deaths among Infants Delivered Alive
Eastern	519	436	3	80	482	47	7	26
Tanga	335	314	10	11	310	21	9	5
Western	1,210	1,057	73	80	1,113	86	16	32
Totals ...	2,064	1,807	86	171	1,905	154	32	63

In addition 2,090 women were delivered in Government Hospitals or as out-patients from Government Hospitals as shown in Table 11.

B.—Mission Maternity Services

PROVINCE	Total Confinements Attended	Normal Deliveries	Miscarriages and Abortions	Abnomal Deliveries	Live Births	Still Births	Deaths of Mothers	Deaths among Infants Delivered Alive
Central	1,862	1,621	50	191	1,745	77	9	43
Eastern	585	540	29	16	545	19	3	7
Lake	1,424	1,157	111	156	1,223	138	22	30
Northern ...	271	214	16	41	239	15	1	6
Southern	689	523	55	111	599	36	8	23
Southern Highlands	34	25	2	7	32	2	1	2
Tanga	1,263	1,121	64	78	1,155	64	11	35
Western	1,485	1,326	55	94	1,370	66	6	85
Totals ...	7,613	6,527	382	694	6,908	416	61	231

In addition, attendance at 1,408 further confinements is reported by Missions but accurate details of deliveries and births are not available.

C.—Native Authority Maternity Services

PROVINCE	Total Confinements Attended	Normal Deliveries	Miscarriages and Abortions	Abnormal Deliveries	Live Births	Still Births	Deaths of Mothers	Deaths among Infants Delivered Alive
Lake	175	125	50	—	125	24	—	—
Northern ...	205	203	2	—	202	1	—	3
Tanga	133	124	8	1	124	1	—	—
Western	451	435	11	5	432	11	1	3
Totals ...	964	887	71	6	883	37	1	6

In addition, attendance at 2,559 further confinements is reported by Native Authorities, but accurate details of deliveries and births are not available.

TABLE 13—NATIVE AUTHORITY MEDICAL SERVICES

Province	Number of Dispensaries	Staff		Total New Cases Attending during 1949	Beds (if any)
		African Medical Auxiliaries	Tribal Dressers		
Central	39	1	38	209,847	81
Eastern	65	15	67	210,536	4
Lake	100	66	50	681,420	—
Northern	45	7	41	134,789	64
Southern	27	—	33	93,597	18
Southern Highlands	49	46	6	289,777	—
Tanga	32	3	31	85,163	5
Western	51	19	34	224,407	53
Totals ...	408	157	300	1,929,536	225

TABLE 14—MISSION MEDICAL SERVICES

Province	NUMBER OF STAFF						BEDS				IN-PATIENTS TREATED YEARLY (a)							OUT-PATIENTS—NEW CASES (b)			
											Males			Females							
	Medical Officers	Hospital Assts. and Dispensers	State Registered Nurses	Unregistered Nurses (European)	Certificated Nurses (African)	Nursing Orderlies and Dressers	European	Asian	African	Total	European	Asian	African	European	Asian	African	Total	European	Asian	African	Total
CENTRAL ...	5	–	19	–	15	111	3	9	295	307	10	41	2,840	13	22	5,976	8,902	32	430	84,092	85,364
EASTERN ...	3	4	8	22	–	21	4	–	350	354	5	–	2,508	–	–	1,422	3,935	26	3	76,636	76,665
LAKE	5	2	20	17	–	98	11	36	472	519	24	91	1,969	28	138	3,141	5,391	140	1,495	44,745	139,710 (c)
NORTHERN ...	2	–	9	6	–	65	1	4	340	345	1	10	2,666	3	16	3,079	5,775	10	122	114,518	114,650
SOUTHERN ...	6	19	29	6	11	125	33	24	1,225	1,282	88	153	10,749	52	299	11,798	23,139	314	763	205,666	206,743
S. HIGHLANDS	1	3	25	–	–	12	1	2	115	118	4	2	1,827	1	6	2,222	4,062	143	146	30,006	30,295
TANGA	4	21	10	1	–	46	10	20	331	361	24	61	2,235	25	65	2,763	5,173	115	230	49,650	49,995
WESTERN ...	1	6	15	6	2	47	4	17	215	236	21	13	1,456	8	36	2,047	3,581	50	509	132,094	132,653
Totals ...	27	55	135	58	28	525	67	112	3,343	3,522	177	371	26,250	130	582	32,448	59,958	830	3.698	738,217	836,075

(a) A number of Centres are small dispensaries or first aid posts with less than 10 beds.

(b) Total Out-patient attendances recorded by Missions = 918,732. It is probable that in a number of cases new attendances and repeat attendances have been confused, and that the number of 'New Cases' is in fact lower than indicated above.

(c) Some Missions have recorded totals only.

TABLE 15—DISTRIBUTION OF MISSION MEDICAL AND NURSING STAFF BY NATIONALITIES

PROVINCE	British	American	Australian	Belgian	Canadian	Danish	Dutch	French	Finnish	German	Irish	Italian	Norwegian	Polish	Swedish	Swiss
CENTRAL ...	2	7	8	–	–	–	–	–	–	–	–	7	–	–	–	–
EASTERN ...	7	–	–	–	–	–	13	1	–	7	–	–	–	–	–	5
LAKE	–	19	–	–	–	2	–	–	–	–	–	–	1	–	–	–
NORTHERN ...	–	4	–	–	–	–	–	–	–	5	8	–	–	–	–	–
SOUTHERN ...	18	1	–	–	–	–	–	–	–	18	–	–	–	–	–	4
SOUTHERN HIGHLANDS	–	–	–	–	–	1	–	–	–	2	–	17	–	–	–	6
TANGA ...	10	2	–	–	–	–	–	–	2	–	–	–	–	–	1	–
WESTERN ...	3	–	–	1	1	4	7	1	–	3	–	–	–	–	6	–
Totals ...	40	33	8	1	1	7	20	2	2	35	8	24	1	–	7	15

TABLE 16—LEPROSARIA

PROVINCE	STAFF			Inmates at 31st January			Admitted during year	Re-admitted	Discharged	Absconded	Births	Deaths from the Disease	Deaths from other causes	Cases Arrested		Inmates at 31st December			Clinical classification cases at 31st Dec.			No. of Non-Lepers resident at 31st December.	
	European	Asian	African	Men	Women	Children 14 and under								Without deformity	With deformity	Men	Women	Children 14 and under	Lepromatous	Neural	Indeterminate	Adults	Children 14 and under
CENTRAL	3	–	7	377	343	55	186	186	7	182	14	36	19	8	2	399	404	90	375	344	133	62	119
EASTERN	3	(a) 2	44	314	191	69	201	8	15	14	2	16	7	66	50	381	243	99	279	270	131	152	24
LAKE	(b) 3	–	4	115	74	39	71	–	11	41	13	6	5	–	–	104	69	63	55	60	115	22	(c)49
NORTHERN	–	–	1	14	2	1	22	1	3	1	0	4	0	1	1	14	2	1	13	4	–	–	–
SOUTHERN (d) ...	5	–	17	1,007	905	272	509	43	67	375	52	13	32	40	37	1,035	923	242	344	1,289	544	286	338
SOUTHERN HIGHLANDS ...	1	–	15	338	264	45	249	58	48	35	24	(e)32	–	–	–	437	341	85	280	583	–	192	354
TANGA	–	–	5	100	19	–	25	–	5	9	2	3	3	9	2	108	19	–	33	40	29	–	–
WESTERN	3	–	3	39	34	9	7	2	1	1	–	6	–	6	10	42	33	8	18	55	8	1	7
TOTALS ...	18	2	96	2,304	1,832	490	1,270	298	157	658	107	116	66	130	102	2,520	2,034	588	1,397	2,645	960	715	891

(a) One Part-time worker.
(b) Two Part-time workers.
(c) Living in an adjacent village.
(d) Figures for Kipatimu Leprosarium not available.
(e) Includes an unspecified number of deaths from other causes.

TABLE 17—HEALTH OF PRISONERS

PROVINCE	Daily Average in Prison	Number Admitted to Hospital	Daily Average in Hospital	Daily Average on Sick List	Deaths
CENTRAL	878·10	378	6·50	32·90	14
EASTERN	1,807·19	231	6.87	253·88	14
LAKE	991·73	376	11·19	33·89	15
NORTHERN	487·10	347	*·78	6·13	1
SOUTHERN	236·85	15	0·37	6·00	2
SOUTHERN HIGHLANDS	123·47	15	0·06	3·77	—
TANGA	546·20	204	13·00	28·30	3
WESTERN	685·62	137	0·70	19·03	11
Totals ...	5,756·26	1,703	*39·47	383·90	60

*Figures incomplete. Daily average in Hospital at Arusha not recorded.

TABLE 18—VITAL STATISTICS: POPULATION

PROVINCE	EUROPEAN			ASIAN			AFRICAN			Grand Total
	Males	Females	Total	Males	Females	Total	Males	Females	Total	
Central	839	562	1,401	2,363	1,874	4,237	384,000	423,000	807,000	812,638
Eastern	1,473	1,102	2,575	12,259	9,711	21,970	447,000	465,000	912,000	936,545
Lake	538	348	886	4,697	3,721	8,418	777,000	872,000	1,649,000	1,658,304
Northern	2,198	3,764	5,962	2,892	2,318	5,210	289,000	286,000	575,000	586,172
Southern	518	215	733	1,572	1,294	2,866	423,000	466,000	889,000	892,579
Southern Highlands	973	1,279	2,252	1,543	1,202	2,745	404,000	457,000	861,000	865,997
Tanga	754	628	1,382	4,808	3.843	8,651	210,000	171,000	381,000	391,033
Western	555	299	854	3,082	2,333	5,415	437,000	493,000	930,000	936,269
Totals ...	7,848	8,197	16,045	33,216	26,296	59,512	3,371,000	3,633,000	7,004,000	7,079,557

Appendix I.

REPORT OF THE SENIOR DENTAL SURGEON

At the beginning of 1949 the establishment was increased to five dental officers, but the aximum number practising during the year did not exceed four and this was reduced to three y the retirement of Mr. Rutter.

Safaris were undertaken to all the Provinces with the exception of the Northern. The Central and Lake Provinces were visited twice during the year. The general increase in the population throughout the Territory has accentuated the demand for dental treatment, and longer visits to each Province are now necessary.

The daily African dental clinic at the Sewa Haji Hospital was maintained throughout the year : during such periods as there was only one dental officer in Dar es Salaam, the sub-assistant surgeon assisted in affording treatment. A similar clinic was held daily by the dental officer in Tanga. Considerable progress was made both in Dar es Salaam and Tanga in treating African schoolchildren, and a large number of fillings and extractions completed. The treatment of African children is extremely important and will help considerably to reduce the oral sepsis which is so prevalent in urban areas.

Until such time as the European staff position improves and African students are forthcoming for training as dental assistants, no extension of the dental service will be possible.

The following table shows the work done by the division during the year :—

	Attendances	Fillings	Extractions	Scalings	X-rays	Root treatments	Dentures	Repairs	Jaw Injuries
Dar es Salaam	8,461	2,309	4,438	612	519	27	322	203	7
Tanga	3,274	1,536	2,103	182	64	3	75	36	9
Totals ...	11,735	3,845	6,541	794	583	30	397	239	16

J. H. Russell,
Senior Dental Surgeon

Appendix II.

ANNUAL REPORT OF THE MALARIOLOGIST, TANGANYIKA

Summary of the Year's Activities

At the beginning of the year Dr. D. Bagster Wilson became Inter-Territorial Malariologist, but the greater part of his time continued to be occupied by the affairs of this Territory, including during the earlier months of the year the construction of a new house. In April Dr. E. N. Emmerson was posted to the Unit and began to take over some of the Territorial responsibilities. Dr. Wilson has visited Mwanza, Malya, Songea, Moshi, Arusha and Dar es Salaam (four times) and made a more extended tour of the Western Province in October. Dr. Emmerson has made tours of the Central and Lake Provinces, and has also visited Kilosa, Morogoro, Arusha, Moshi and Lindi. The Entomologist has visited the Mlalo Basin in the Usambaras, and Morogoro and Tanga. Repeated visits have been paid to estates on the Central and Tanga lines, as well as to urban controls at Moshi, Korogwe, Tanga, Morogoro, Kilosa, and one or more visits to Musoma, Mwanza, Shinyanga, Tabora, Kigoma, Kilosa, Kondoa, Mpwapwa, Iringa, Mbeya. Much of this visitation has however been totally inadequate owing both to the shortage and to the inexperience of the staff available. Moreover owing to the rainfall shortage and to the increasing dessication of most areas, there has been little stimulus to the local staff, or occasion for finding out the actual deficiencies in the execution of mosquito control. For the same reason the continuation of the field trials of insecticides, started in 1948, has been fraught with difficulties, and the assessment of results hampered by the absence of the essential criteria of *Anopheles* and malaria transmission. Some additions have been made to our knowledge of the endemicity of malaria in the western part of the Territory, and regular anopheline catches in urban areas are beginning to give information not only of the efficiency of control, but also of the relative intensity of anophelism in the various localities.

Staff : European

Medical Officers.—Dr. E. N. Emmerson from April to the end of the year.
Temporary Medical Officer.—Mrs. M. E. Wilson from the beginning of the year to October 31.
Entomologist.—Mr. J. Phipps on duty the whole year.

Malaria Field Officers.—

Mr. P. N. Jenkins on duty the whole year.
Mr. A. J. Slatter on duty from the beginning of the year until August 31.
Mr. H. G. Bilcliffe arrived on first appointment on July 3, and on duty to the end of the year.

The effective establishment of Field Officers remains at two, still owing to the shortage of housing, while the need for a third officer grows no less.

AFRICAN

The two senior assistants have continued to provide an important pivot and there are now five graded Malaria Assistants, and seven ungraded, most of whom show every promise of being worthy of grading during 1950. There *are nine* others who will certainly become useful members of the Malaria Orderly group, for which provision has been made in 1950 and in one or two cases possibly rise to the Malaria Assistant grade. There was thus a ne increase of only three during the year, but all those, with one exception, about whom there was any doubt have now been discharged or reclassified. Although there are many applications, there is a great dearth of suitable applicants. Sixteen men have been discharged after varying, and sometime long, periods of trial.

A similar process of training and eliminating has given an increase of one only in the men employed on estates: The chief cause of wastage in this case is the dissatisfaction of the men with various aspects of their employment.

The clerical assistance available is totally inadequate, consisting only of one unreliable schoolboy in the latter part of the year, and much of the time of the medical officers has been spent in doing this work.

TRAINING

Owing to the preoccupation with the details of administration and construction, the intended programme has not been fulfilled, and only two African courses were held. a Senior Course for ten in April, and a Junior Course for eight in June. In addition Mr. F. M. Mzoo instructed a group of eleven Mosquito Finders at Mbeya in May, and a course for eight Asian Supervisors was held at Tanga in September. Continuously through the year there has been a variable number of Africans undergoing elementary training for estates and other work.

MALARIA SURVEYS

In the western part of the Territory, a few observations were made in the last quarter. On the hill above Kigoma the Spleen Rate was found to be 48 per cent, a rather unexpectedly low figure; at Kasulu the Spleen rate was 37 per cent, and at Kibondo 44 per cent. In two typical localities forty-five miles south of Bukoba the Spleen Rates, determined by Dr. Currie, were 6 and 15 per cent, and blood examinations made here gave rates of sixteen and twelve in children, and 15 and 5 per cent respectively in adults. The rather high malaria morbidity, with a seasonal incidence, reported by the tribal dispensaries, is thus found to be based on a corresponding series of endemic indices. These observations should be expanded and confirmed, on account both of their local and more general significance.

A survey of Arusha showed that while the main residential area is still substantially anopheline free, there was heavy vector breeding and adult infestation along the line of the Railway. This breeding is essentially and easily controllable.

The findings in Bukoba District add yet another sector of the Territory in which it is now clear that malaria is important as a cause of clinical illness, supporting one of the conclusions of the 1948 report of this unit.

CONTROL METHODS AND MATERIALS

The doubt expressed in the 1948 report of this unit, as to the probable usefulness of Proguanil, has been reinforced by further experience not only in East Africa but in other parts of the world. In spite of a negligible response on the part of Medical Officers to repeated requests for reports on break-through under proguanil suppressive treatment, personal and other experience has led to the collection of some eighteen cases of such an occurrence. At the request of the Senior Health Officer of the Overseas Food Corporation, we were able to assist in the confirmation of a group failure of suppression in the Southern Highlands.

Results of some further investigation into the use of residual insecticides are given later in this report, but it may be said that there has been no appreciably greater definition of the part that this form of control may be expected to play under tropical African conditions, during the course of the year. It is anticipated that a major investigation to be started in 1950 by the Colonial Insecticide Research and East African Malaria Units will provide some definitive information on this subject. In the meanwhile it may be stated with some certainty that gammexane use for this purpose cannot be expected to have an effective action (or any standards) lasting more than three months. This makes this method an expensive one. The local availability of Shell Ditrone D.P., containing DDT. is an accession of value for this method.

In spite of difficulties arising from the dry year, the observations made on the use of a gammexane larvicide justify the interim opinion that these high concentration larvicides can be used effectively, granted suitable equipment, and this criterion is met by a combination of knapsack sprayers with a very fine nozzle, such as those that have been obtained from the Spraying Systems Company of Chicago. This combination allows the dispersal of a very fine mist in small and controllable amount.

What is believed to have been a sudden deterioration in the effectiveness of Shell Malariol has caused serious perturbation during the latter part of the year, and has been given immediate investigation both by Shell Chemicals and by this unit. The causes are obscure but some improvement has already been achieved and further study is continuing.

At the same time the increasing price of oils, to which may be added the proposal to charge duties on the materials for this preparation gives an added impetus to the search for means of using effectively and economically the larvicides of higher toxicity containing DDT or BHC. Unless this can be achieved, the cost of mosquito control will rise disproportionately, even as compared with the generally rising costs. Already a recommendation has been made that a DDT solution should be used as a routine for the control of insect breeding in latrines.

For space spraying, and the dispersal of small quantities of fluids, the continuous type of Sovereign sprayer has been tried and found satisfactory, and provides advantages of some importance at little increase in cost (about 2/- on 4/50).

ANOPHELINE INFESTATION

The regular use of fixed catching stations, searched by spray killing, is coming into use as Malaria Assistants become available and, although not all the use is made of them by local health authorities that might be made, they are beginning to provide criteria that cannot otherwise be obtained. Results from places in which they have been in progress for sufficiently long are shown in the following tables. In following them it should be noted that peripheral stations are those within half a mile of the edge of the control area, and the percentage reduction given is that of the central stations upon these peripheral stations. The uncontrolled stations are well outside the control area, but it may be remarked that in some cases, as for example at Moshi, it is very difficult to find houses liable to a degree of infestation equal with those in the control area.

The liberty has been taken of reproducing the results from the reports of the Medical Officer of Health, Dar es Salaam, since these are of great and general significance. It has required the *maintenance* of the percentage reduction figure above 98·5 per cent to arrest malaria transmission in the central area of Dar es Salaam. Conversely whenever this figure has dropped below 98·5 for a period of more than two or three weeks cases have begun to appear. Examination of the detailed figures (not reproduced) shows how successive increases in the efficiency of control in various areas have contributed to the general reduction in anopheline infestation.

In other places there is apparently some progress to be observed, but in this exceptional year this is not to be assumed. On the other hand it is only too apparent how much there is still to be done before the inhabitants of these places can expect protection from attacks at the dangerous periods of the year. The comparatively easy task of protection for the greater part of the year is none the less a worthwhile achievement.

TABLE :—

I. DAR ES SALAAM.
II. MOROGORO.
III. TABORA.
IV. MOSHI.
V. MBULU.

Month 1947	Ex-Limital	Peripheral	Central	Reduction between 5 & 6	Month 1948	Ex-Limital	Peripheral	Central	Reduction between 5 & 6
DAR ES SALAAM									
January	36·0	1·4	Nil	99·3	January	51·6	6·6	0·1	99·09
February	60·1	4·2	Nil	99·4	February ...	44·4	6·6	Nil	99·25
March	61·9	10·9	Nil	99·7	March	68·8	15·0	0·2	98·87
April	74·2	19·1	Nil	98·4	April	65·7	19·4	0·6	97·06
May:					May:				
3rd	100·9	17·9	2·5	83·0	8th	65·5	96·6	1·9	98·65
10th	192·1	40·4	4·9	88·0	15th	30·3	62·1	1·0	98·40
17th	197·0	79·3	6·2	92·0	22nd	65·9	43·5	0·9	98·02
24th	104·6	48·4	3·6	92·0	29th	95·7	28·5	0·6	97·82
31st	246·6	106·5	10·0	91·0	June:				
June:					5th	64·1	42·3	0·6	98·54
7th	239·4	89·3	4·1	95·0	12th	98·8	45·1	0·1	99·69
14th	153·4	101·2	1·2	99·0	19th	51·0	39·8	0·3	99·17
21st	125·7	83·8	1·1	99·0	26th	21·6	19·8	Nil	99·75
28th	128·2	47·6	1·7	96·0	July	36·3	6·9	0·1	98·39
July	78·2	21·1	0·3	98·5	August	24·0	9·2	0·1	99·35
August	61·2	18·0	Nil	99·7	September ...	39·5	13·1	Nil	99·85
September ...	58·6	9·1	0·1	98·5	October	33·7	9·6	0·1	99·27
October	54·1	8·1	0·1	99·2	November ...	32·4	13·9	Nil	99·64
November... ...	32·5	7·3	0·1	97·9	December ...	13·1	10·0	Nil	99·69
December ...	55·2	9·7	0·1	99·1					

Month 1949	Ex-Limital	Peri-pheral	Central	Month 1948	Ex-Limital	Peri pheral	Central	Per cent reduction	
								1949	1948
MOROGORO									
January	0·3	0·4	Nil	January	1·4	1·4	0·3	100	86
February	Nil	2·2	Nil	February	0·5	1·2	0·3	100	75
March	Nil	0·4	Nil	March	1·1	1·0	1·3	100	–
April	3·4	2·5	0·9	April	9·0	4·4	3·9	64	11
May	7·9	4·7	1·8	May	8·5	4·7	1·4	62	70
June	5·3	2·4	0·4	June	3·1	1·0	0·4	83	60
July	2·8	2·7	1·3	July	1·4	1·1	0·1	52	90
August	0·4	1·0	Nil	August	1·2	0·5	Nil	100	100
September	Nil	0·7	Nil	September	0·4	0·7	Nil	100	100
October	Nil	0·2	Nil	October	0·2	0·1	Nil	100	100
November	Nil	0·2	Nil	November	0·3	1·0	Nil	100	100
				December	0·1	0·5	Nil	–	100

	Uncon-trolled 1947	Peri-pheral	Central	Uncon-trolled 1948	Peri-pheral	Central	Uncon-trolled 1949	Peri-pheral	Central	Per cent reduction		
										1947	1948	1949
TABORA												
January	–	–	–	2·4	4·3	3·1	2·1	3·8	0·2	–	28	97
February	–	–	–	3·5	7·8	6·0	2·5	1·0	Nil	–	23	100
March	–	–	–	3·9	11·8	4·6	3·3	2·5	Nil	–	61	100
April	–	–	–	53·8	36·5	3·5	3·1	1·7	Nil	–	90	100
May	10·6	7·4	0·5	9·9	14·5	2·0	4·0	1·6	0·1	93	86	94
June	5·2	2·8	0·3	8·2	2·0	0·9	0·9	0·5	0·1	89	51	80
July	2·1	1·6	0·1	4·8	1·9	0·4	0·1	Nil	Nil	94	79	–
August	2·1	3·4	0·2	3·0	1·6	0·3	0·3	Nil	Nil	94	81	–
September	1·3	1·4	0·5	Nil	0·4	Nil	0·7	0·1	Nil	64	100	–
October	0·6	1·1	0·1	Nil	0·1	Nil	0·6	Nil	Nil	90	100	–
November	0·6	1·6	0·7	2·8	1·0	0·3	1·3	0·3	Nil	56	70	100
December	2·2	3·2	0·8	5·4	1·1	0·1	–	–	–	75	90	–
MOSHI												
January	–	–	–	1·5	17·4	Nil	2·6	6·2	0·2	–	100	97
February	–	–	–	3·7	11·3	Nil	0·2	5·9	0·1	–	100	98
March	–	–	–	4·3	8·5	Nil	0·3	1·7	Nil	–	100	100
April	4·7	6·6	1·0	6·3	10·2	0·5	0·9	7·9	0·1	85	95	99
May	3·4	7·7	1·1	7·3	12·0	1·2	1·4	5·7	0·1	86	90	98
June	3·7	16·9	1·6	3·9	7·9	0·8	0·1	3·6	Nil	91	90	100
July	2·7	5·5	0·5	0·8	0·9	Nil	0·1	0·9	Nil	90	100	100
August	1·8	3·6	0·2	0·9	1·8	Nil	Nil	0·8	Nil	94	100	100
September	1·3	1·8	0·3	0·3	0·4	Nil	Nil	1·7	Nil	83	100	100
October	0·4	0·1	Nil	0·8	0·7	Nil	Nil	3·1	Nil	100	100	100
November	0·3	Nil	Nil	1·5	1·0	Nil	0·5	2·8	Nil	–	100	100
December	0·7	4·3	Nil	2·3	3·9	Nil	2·4	3·6	Nil	100	100	100
MBULU												
January	–	–	–	–	–	–	0·7	0·2	0·2	–	–	–
February	–	–	–	–	–	–	0·6	0·2	0·1	–	–	–
March	–	–	–	–	–	–	0·4	0·2	0·1	–	–	–
April	–	–	–	–	–	–	0·5	Nil	0·1	–	–	–
May	–	–	–	–	–	–	–	–	–	–	–	–
June	–	–	–	–	–	–	0·5	0·1	2·5	–	–	–
July	–	–	–	1·6	1·2	0·3	0·1	0·1	Nil	–	–	–
August	–	–	–	0·8	0·3	0·2	0·1	Nil	Nil	–	–	–
September	–	–	–	0·8	0·1	0·4	0·1	0·1	Nil	–	–	–
October	–	–	–	0·9	0·3	0·5	0·2	0·0	0·0	–	–	–
November	–	–	–	1·9	1·1	0·7	0·3	0·1	0·1	–	–	–
December	–	–	–	0·4	0·0	0·1	–	–	–	–	–	–

ORGANIZATION AND PRACTICE OF MOSQUITO CONTROL

Redistribution of funds, as between anopheline and domestic control, and between one place and another has at length reached a more appropriate basis in 1950 estimates. During 1949, there was a considerable shortage of funds in some places, but owing in this case to the fortunate dryness of the year this was not of very critical importance. Effective control was in fact more handicapped by the lack of knowledge among the supervisory staff than by lack of funds. The outstanding needs for further progress in the improvement of control work are instruction of the European staff responsible locally, a more effective liaison between this unit and them, and more direct interest and encouragement of the work of the trained African staff. It is regretted that this unit has so far failed to achieve its function in this liaison. This may be inevitable at this stage of development, especially in an occupation where experience counts for so much, but the failure must not the less be admitted. At the same time it must also be recorded that advice on technical problems has been sought from few places through medical channels, whereas many requests have been received both from other departments and private undertakings.

The same difficulty, of ensuring local interest and supervision, arises in the case of estates, but some steady improvement has to be recorded in a number of cases, and eleven estates are now undertaking control with varying degrees of success, in addition to those working under the supervision of the Ross Institute. The initial handicap of difficulty in obtaining equipment has now been overcome, with the co-operation of local firms.

Additional surveys have been carried out at *Dar es Salaam*, and the magnitude of the problem to be faced now and in the future becomes increasingly apparent. Some means for reducing capital and recurrent expenditure has to be found, and as the most probable way of doing so, and at the same time of increasing the efficiency of control, is by air-spraying, the assistance of the Colonial Insecticide Research has been sought in attempting to prove this method, and it is hoped that some air-spraying will be carried out in 1950. The succession of dry years is perhaps flattering to the achievements of the health staff, but none the less the mosquito records given in Table 1 are very impressive.

At *Moshi* effective control has been consolidated, and at Mbulu a small expenditure has apparently effected a considerable change in the malaria risk, providing an example of what may be done for the smaller stations within economic limits.

There has been some recession in the effectiveness of control at *Morogoro*, in spite of the favourable year.

A complete reorganization has been effected at *Kigoma*, and it is hoped that considerable improvement will ensue, but some major capital expenditure will be required before complete results can be expected. The same is true of *Tabora* but the greatest need here is for constant attention to the detail of routine larvicidal work. Increasing availability of funds should give a fillip to such effort.

INVESTIGATIONS

1. *Effect of Residual Treatment with Gammexane on Malaria in an estate Labour Force.*

This investigation has continued throughout the year. The criterion is the parasite rate and infestation in the labour force, one large camp having been left untreated, and the remainder treated with gammexane P.530 at a rate of 2 gm. BHC per square metre in December, 1948, and June, 1949, and at half this dosage in October, 1949, the intention being to continue three monthly treatments, in view of the evident disappearance of effect after about three months.

The results to date are shown in Tables VI and VII. There has been no peak of Anopheles in 1949, and results in these terms are indefinite, although slight. On the other hand parasite rates have been well maintained in spite of the dry year and it is evident how little effect has been produced in this respect. A high proportion of the labour is susceptible to malaria, and the great majority have been resident for the whole year.

TABLE VI—AVERAGE FEMALES ANOPHELES PER HOUSE

Period	Untreated camps	Treated camps near River	Treated camps away from River	
1948:				
May 29th	13·5	Nil	0·1	Treated 4th May.
June 12th	13·0	Nil	0·1	
June 26th	22·5	0·4	0·1	
July 10th	4·1	1·0	0·5	
July 24th	4·9	1·1	0·8	
August 7th	14·6	7·4	1·8	
August 21st	14·7	7·0	2·7	
September 4th	5·7	2·5	2·5	
September 18th	7·5	3·3	2·4	
October 2nd	3·2	4·2	1·2	
October 16th	14·0	10·0	2·8	
October 30th	16·5	47·8	7·2	
November 13th	20·6	21·8	4·0	
November 27th	10·0	16·5	5·1	
December 11th	12·6	4·9	3·8	Treated 10th Dec.
December 25th	2·8	0·8	0·5	
1949:				
January	3·3	1·1	1·2	
February	3·0	1·7	1·1	
March	1·4	0·9	1·0	
April	2·8	1·6	2·0	
May	2·6	2·4	2·0	
June	1·6	2·0	0·7	Treated 29th June.
July	1·3	0·02	0·2	
August	1·5	0·07	0·4	
September	3·0	0·02	1·2	
October	1·8	0·03	0·8	Treated 12th Oct.
November	1·9	0·05	0·3	
December	—	—	—	

TABLE VII

Period	Exam.	Rate	Parasite infestation	Exam.	Rate	Parasite infestation
				Treated 1st May 1948		
2nd November 1948	100	46	19	100	36	58
				Treated 2nd Dec. 1948		
1st February 1949	100	40	21	200	28	16
28th March 1949	98	45	18	102	28	16
26th May 1949	100	45	10	100	42	7
				Treated 3rd July 1949		
2nd August 1949	100	53	8	100	40	7
				Treated 12th Oct. 1949		
14th November 1949	90	47	18	150	39	13

2. *Effect of Residual Impregnation with Gammexane on Anopheline Behaviour in a Group of Houses.—By Mr. J. Phipps.*

The experiment was continued as in 1948, with certain additions. Reimpregnation was carried out on 12th May, 1949.

Four houses were left untreated. Ten houses were impregnated with Shell DITRENE, a water-dispersable powder containing 50 per cent DDT at about 200 mg. DDT per square foot. Of the ten houses so treated, five were those originally treated with DDT in diesolene, two were newly-built, and three had been treated originally with benzene hexachloride.

The remaining 66 houses and all kitchens and latrines were treated as before with water-dispersable benzene hexachloride at the rate of 200 mg. per square foot. Furniture was not impregnated.

During April, five trap huts were installed in the camp. These are of wood, with gauze-covered windows, all but two of which were completely closed. At top and bottom of each of the two open windows was an aperture two feet long and half an inch wide to allow entry of mosquitoes. The Funnel traps, like those in use on the houses, were fixed to one side of each hut trap, to catch mosquitoes attempting to leave. One African slept in each hut during the night. The hut traps were sited on the extreme periphery of the camp before and during impregnation, in order to attempt to determine whether the large decrease in mosquito catches following impregnation was due to an actual absence of mosquitoes from the neighbourhood, or to their refusal to enter recently treated houses. Later, the hut traps were moved into the camp area, as people were otherwise afraid to sleep in them. Hand catching of mosquitoes was carried out in the trap huts every day.

Catching of mosquitoes in the houses was carried on as before, and in the same houses, by pyrethrum spray. Weekly spray catches were also made in the two "villages", each of two inhabited houses, situated 120 yards, and half a mile respectively from the nearest treated houses.

Catches in the two outside "villages" given in Table VIII show that in the village farthest from the camp, and near to the dam in which most of the breeding was occurring, numbers of Anopheles fell considerably after January, 1949. Numbers in the other "village" followed those in the first quite closely, being at the same time always lower. Numbers of culicines, however, in both villages showed a tendency to rise after May, reaching a maximum in August and declining again in September.

Catches of Culicines in the main camp are shown in Table IX. There was no fall in the Culicines population of the *untreated* houses immediately after impregnation, and in fact numbers began to rise in treated and in untreated houses in June, being considerably higher in the BHC treated houses than in the untreated ones during July, August and September. The differences are certainly significant, but in the case of one house, where numbers were always very high, and which contributed considerably to the high average obtained, it is known that this was due to the attractiveness of the inhabitants, as change of occupant was followed by a great fall in mosquito numbers.

Catches of *Anopheles* in the main camp are exhibited in Table X. Here the difference between untreated and BHC-treated houses in January is not significant. Impregnation was followed, as usual, by a fall in catches in untreated houses as well as in treated ones.

All numbers are so low after impregnation that it is impossible to draw conclusions as to the repellent effects of DDT and BHC, but it is noticeable that traps on untreated houses were invariably negative after impregnation, while mosquitoes, most of which were alive, were taken in traps on treated houses. None were found dead on the floor until August, when they were found also in untreated houses. There can be no doubt that the inhabitants of some houses were using pyrethrum spray to combat the Culicine nuisance, which was at its peak during these months, in spite of action taken, to prevent this. Figures for Culicines indicate that approximately the same average numbers were found in traps on DDT-treated and BHC-treated houses, though those in traps on DDT-treated houses formed a greater percentage of the (smaller) total.

Catches in trap huts are shown in Table XI, they indicate that the same sort of fall in numbers followed impregnation, as occurred in untreated houses in the camp, and that mosquitoes were taken in window-traps on these huts only after impregnation. The numbers, particularly of *Anopheles*, entering these huts, were, however, always low.

Analysis of ovarian stages is as yet incomplete. Most of those taken in window traps on all houses were either Stage I (with undeveloped ovaries and unfed) or Stage V (with fully-developed eggs). Other stages, containing blood and with ovaries in various stages of development, were found in houses. This would appear to indicate that a mosquito leaves the house either before feeding or in order to oviposit. Those which feed appear to rest in the house.

There is some indication that in Culicines, which were the only mosquitoes sufficiently numerous after impregnation to allow calculations to be made, impregnation was followed by the appearance of a larger proportion of the earlier ovarian stayes. This was more marked in BHC-treated houses than in untreated ones, but the number at first present in DDT-treated houses was too low for calculations to be made.

TABLE VIII—ADULT CATCHES IN TWO "VILLAGES" NEAR IMPREGNATED HOUSES

	Houses Searched	Average Female Anopheles	Average Female Culicines
	A.—120 Yards from Camp		
1948:			
July	6	7·2	6·5
August	6	8·2	10·3
September	8	1·0	49·5
October	7	0·1	17·3
November	8	1·0	31·5
December	9	3·8	14·4
1949:			
January	8	10·8	4·4
February	8	2·4	5·3
March	10	3·0	2·2
April	7	1·7	1·3
May	7	1·1	2·4
June	10	0·7	10·5
July	8	0·4	1·0
August	8	1·4	26·4
September	6	Nil	9·5
	B.—Half Mile Away		
1948:			
July	6	15·3	44·5
August	6	24·0	114·5
September	8	3·4	85·6
October	8	4·8	53·1
November	7	7·0	33·9
December	8	10·1	22·6
1949:			
January	6	64·7	13·2
February	6	6·0	8·0
March	8	8·9	5·6
April	5	6·4	3·6
May	5	8·6	13·6
June	8	5·0	17·2
July	6	2·0	12·0
August	8	13·1	113·1
September	6	0·5	48·0

TABLE IX.—AVERAGE FEMALE CULICINES

	Spray catch	Trapped		Total	Sheets	Total of Average
		Alive	Dead			
Untreated						
1948:						
July	15·0	0·8	0·1	0·9	—	15·9
August	22·5	2·6	0·2	2·8	—	25·3
September ...	19·5	2·0	0·7	2·7	—	22·2
October	19·1	1·3	0·2	1·5	—	20·6
November ...	23·3	0·3	Nil	0·3	—	23·6
December ...	9·4	0·6	0·7	1·3	—	10·7
1949:						
January	3·9	Nil	Nil	Nil	—	3·9
February	3·4	0·1	Nil	0·1	—	3·5
March	1·5	Nil	Nil	Nil	—	1·5
April	1·3	Nil	Nil	Nil	—	1·3
May	1·3	Nil	Nil	Nil	—	1·3
June	2·2	0·1	Nil	0·1	—	2·3
July	3·5	1·0	Nil	1·0	—	4·5
August	9·4	1·0	Nil	1·0	6·6	17·0
September ...	11·8	0·3	0·7	1·0	7·5	20·3
Treated DDT						
1948:						
July	0·5	5·7	0·4	6·1	2·0	8·6
August	0·8	8·8	0·8	9·6	2·0	12·4
September ...	4·7	3·7	0·1	3·8	Nil	8·5
October	3·9	2·3	1·7	0·0	Nil	6·4
November ...	6·2	2·0	0·2	2·2	Nil	8·4
December ...	3·8	0·5	0·3	0·8	Nil	4·6
1949:						
January	2·1	0·2	Nil	0·2	Nil	2·3
February	1·8	0·1	0·1	0·2	Nil	2·0
March	0·7	0·1	0·1	0·2	Nil	0·8
April	0·4	0·05	0·05	0·05	Nil	0·45
Treated						
May	0·0	0·0	0·0	0·0	—	0·0
June	0·6	0·4	0·1	0·5	—	1·1
July	1·7	1·0	0·0	1·0	0·2	2·9
August	5·2	2·5	0·1	2·6	3·0	10·8
September ...	4·7	1·8	0·2	2·0	7·0	13·0
Treated BHC						
1948:						
July	0·1	2·2	1·7	3·9	2·5	6·5
August	2·3	3·3	0·6	3·9	6·4	12·6
September ...	22·0	1·4	0·3	1·7	0·6	24·3
October	23·4	1·2	Nil	1·2	1·0	25·6
November ...	28·7	1·4	0·3	1·7	Nil	30·4
December ...	16·4	0·4	0·2	0·6	0·4	17·4
1949:						
January	7·1	0·2	0·04	0·24	0·1	7·4
February	6·2	0·5	0·02	0·52	Nil	6·72
March	2·1	0·3	0·04	0·34	Nil	2·44
April	4·4	0·2	0·0	0·2	Nil	4·6
Treated						
May	0·2	0·0	0·0	0·0	0·4	0·6
June	2·0	0·02	0·0	0·02	0·6	2·62
July	9·6	0·6	0·0	0·6	0·2	10·4
August	61·7	2·6	0·1	2·7	2·4	66·8
September ...	56·2	2·5	0·3	2·8	3·5	62·5

TABLE X.—AVERAGE FEMALE ANOPHELES

Untreated						
1948:						
July	Nil	0·8	Nil	0·8	Nil	0·8
August	Nil	0·1	0·1	0·2	Nil	0·2
September	Nil	Nil	Nil	Nil	Nil	Nil
October	0·3	0·1	Nil	0·1	Nil	0·4
November	1·4	Nil	Nil	Nil	0·3	1·7
December	1·4	Nil	Nil	Nil	Nil	1·4
1949:						
January	1·6	0·2	Nil	0·2	Nil	1·8
February	0·9	0·0	Nil	Nil	Nil	0·9
March	1·0	Nil	Nil	Nil	Nil	1·0
April	1·0	Nil	Nil	Nil	Nil	1·0
May	0·2	Nil	Nil	Nil	Nil	0·2
June	0·3	Nil	Nil	Nil	Nil	0·3
July	0·2	Nil	Nil	Nil	Nil	0·2
August	0·1	Nil	Nil	Nil	0·3	0·4
September	Nil	Nil	Nil	Nil	0·5	0·5
Treated DDT.						
1948:						
July	Nil	Nil	Nil	Nil	Nil	Nil
August	Nil	0·1	0·1	0·2	0·2	0·4
September	Nil	Nil	Nil	Nil	Nil	Nil
October	Nil	Nil	Nil	Nil	Nil	Nil
November	0·2	0·2	Nil	0·2	Nil	0·4
December	0·1	0·05	Nil	0·05	Nil	0·15
1949:						
January	1·0	0·4	Nil	0·4	Nil	1·4
February	0·1	0·1	Nil	0·1	Nil	0·2
March	0·1	0·1	Nil	0·1	Nil	0·2
April	0·1	Nil	Nil	Nil	Nil	0·1
May (Treated)	Nil	Nil	Nil	Nil	Nil	Nil
June	Nil	0·1	Nil	0·1	Nil	0·1
Treated DDT.						
1949:						
July	0·1	Nil	Nil	Nil	Nil	0·1
August	Nil	Nil	Nil	Nil	0·2	0·2
September	Nil	Nil	Nil	Nil	Nil	Nil
Treated BHC.						
1948:						
July	Nil	0·2	Nil	0·2	Nil	0·2
August	Nil	Nil	Nil	Nil	0·2	0·2
September	0·1	Nil	Nil	Nil	0·2	0·3
October	0·3	Nil	Nil	Nil	0·1	0·4
November	0·9	0·04	Nil	0·04	Nil	0·94
December	1·8	Nil	0·03	0·03	0·1	1·93
1949:						
January	8·2	0·1	Nil	0·1	Nil	8·3
February	1·2	0·02	Nil	0·02	Nil	1·22
March	0·6	0·02	0·02	0·04	Nil	0·64
April	3·1	0·1	Nil	0·1	Nil	3·2
May	Nil	0·03	Nil	0·03	Nil	0·03
June	0·05	Nil	Nil	Nil	Nil	0·05
July	0·4	0·03	Nil	0·03	Nil	0·43
August	0·2	Nil	0·02	0·02	0·14	0·36
September	0·3	Nil	0·0	Nil	Nil	0·3

TABLE XI.—TRAP HUT CATCHES

	Average per hut	Female Anopheles per night	Average per hut	Female Culicines per night
	In hut	In Window Traps	In hut	In Window Traps
April	0·3	0·0	0·7	0·0
May (before impregnation)	0·2	0·0	0·3	0·0
May (after impregnation)	0·05	0·0	0·05	0·3
June	0·0	0·1	0·0	0·9
July	0·05	0·05	0·7	0·3
August	0·0	0·0	2·2	0·05
September	0·0	0·0	3·7	0·9

All mosquitoes in window traps were alive with the exception of 3 Culicines in August.

3. *Ecological Study of Anopheline Breeding Places in the Muheza Area.—By Mr. J. Phipps.*

Work was commenced on a study of Anopheline breeding places on 24th October, 1949. At this time water could be found only in streams and no very large numbers of larvæ were present anywhere. Breeding places were selected, and also places appearing suitable for breeding, but in which no larvæ were found. In each place the following observations were made regularly :—

(1) Water temperature.

(2) Collection of water samples for chemical analysis.

(3) Collections of plants for identifications.

(4) Collection of other organisms in the water with special reference to those known or thought to be predators of mosquito larvæ.

(5) Keeping predators in the laboratory and recording of mosquito larvæ eaten. As so few Anopheline larvæ were available predators have so far been fed on Culicine larvæ (mainly *Culex fatigans*) but experiments in their capacity to destroy Anopheline larvæ will be carried out when larvæ can be obtained in quantity.

Since commencement of the work, all but three of the selected breeding places have dried up, and of these three one has become very foul.

Anopheline larvæ found include *A. funestus*, *A. coustani* and *A. gambiæ*.

Plant determinations and results of water analysis are not yet to hand.

Water Temperature.

Where Anopheline larvæ were found water temperatures, mostly taken between 0900 and 1200 hours, varied between 25°C. and 28°C. One place, heavily shaded, was constantly at 21°C., and one, more recently, has been at 34°C.—35°C. Larvæ of *A. gambiæ* have been found here.

Other organisms taken in the water include :—

Predators (by laboratory observation).

Small water tortoises, not yet identified, but possibly *Polomedusa galeata* described by Lewis in the Sudan.

Nymphs of Odonata.

Heteroptera, especially Belostomatidæ and Notonectidæ.

Coleoptera-Dytiscidæ.

Fish.

Non-predators.

Coleoptera-Hydrophilidæ.

Nymphs of Ephemerophera.

Crustacea-Copepoda and Branchiopoda and Crabs.

Snails.

Tadpoles of various Amphibia.

Results of laboratory observations of predators suggest that it may be worth while to investigate the biology of the water tortoises referred to, as they may be of use in naturalistic control. Two tortoises have been maintained in the laboratory for about two months, and during the whole of this time each has eaten at least 400 larvæ and pupæ per day. Pupæ and large larvæ are taken before the smaller larvæ; that they feed also Anopheline larvæ is shown by the fact that in one well, which contained several tortoises, 4th stage larvæ and pupæ were never found, though 1st and 2nd stage larvæ of *A. gambiæ* were usually present. Removal of the tortoises during cleaning of the well was followed by the appearance of mature larvæ and pupæ of *A. gambiæ*.

Each dragon fly nymph may eat about ten larvæ per day, smaller nymphs generally taking smaller larvæ. They maintain themselves quite well on Anopheline larvæ.

Bugs of the family Belostomatidæ appear to be very effective predators of mosquito larvæ, large ones taking about twenty per day, and living for at least some months. One has been kept in the laboratory for three months, and was taken as an adult.

Notonectidæ are quite effective predators, taking six-seven larvæ per day.

Beetles of the family Dytisicidæ are not important predators of mosquito larvæ. They appear to take larger organisms more readily.

Though the small fish taken in most breeding places have been classed with the predators, none have ever fed on mosquito larvæ in the laboratory. More observations will be made on this point.

4. *Practical Application of a Gammexane Larvicide.*

This investigation also has been severely handicapped by the dry conditions and lack of observable criteria. Thus no further observations are to be recorded in the case of rice fields. After the preliminary essays during 1948, the dosage used was stabilized at 6 oz. of the BHC concentrate, LG110, diluted to half a gallon with diesolene, and two per cent fatty acids added per acre. This dosage was of course quite approximate, no special measures were undertaken to maintain it. Oilers were given preliminary instruction and demonstration of the amount it was desired to use.

Application was by means of a pneumatic knapsack sprayer (Kent No. 4), with trigger lance and very fine nozzle (Spraying Systems ¼ LN).

The results were compared with malariol applied in the usual way (about 15 gallons/acre).

TABLE XII.—LARVAL SEARCHES IN TREATED BREEDING PLACES

	WELLS						STREAMS					
	Malariol			BHC.			Malariol			BHC.		
	Searched	Positive	Average Larvæ in Positive	Searched	Positive	Average Larvæ in Positive	Searched	Positive	Average Larvæ in Positive	Searched	Positive	Average Larvæ in Positive
Jan. ...	11	1	10·0	7	0	0·0	12	0	0·0	5	0	0·0
Feb. ...	11	2	16·5	15	1	5·0	16	5	1·4	6	1	1·0
June ...	31	0	0·0	30	0	0·0	48	1	8·0	28	0	0·0
July ...	49	5	2·4	46	2	6·5	60	3	3·0	46	0	0·0
Aug. ...	36	2	7·0	39	2	1·0	48	5	4·4	27	0	0·0
Per cent Positive		7·4			2·2			7·6			0·9	
Average Larvæ in Positive ...		17·2			5·0			11·5			1·0	

So far as the effect of the two treatments were reflected in the anopheline house infestation, there were approximately equal results. BHC 33-73 per cent control, Malariol 22-28 per cent control. But it should be noted that the treatment covered a half mile radius only.

In the larval searches of fixed catching stations the results as shown in Table XII are again fairly equal, but control with BHC was definitely superior to that with malariol. It is to be noted that the tests as carried out are extremely exacting, although only third and fourth stage larvæ and pupæ recorded for "positives".

D. Bagster Wilson,
Malariologist

REPORT OF THE NUTRITION OFFICER

I. *Nutrition School.*

A team was sent to the month's Nutrition School held at Makerere College in February, consisting of the following :—

1. Miss H. M. Dewey—Nutrition Officer.
2. D. H. Drennan, Esq.—Agricultural Officer.
3. Dr. R. G. Drummond.
4. Dr. R. C. MacLeod—Chief Hygiene Officer, O.F.C.
5. Miss M. F. E. Pelham-Johnson—Assistant Director of Education (Girls' and Women's Education).

Some valuable technical information and an appreciation of the wider aspects of nutrition and its problems were gained by the team and a report was drawn up which included the available information on nutrition in the territory and recommendations for measures of improvement which could be taken. As the result of this report a Committee is being set up to consider the advantages of forming a Standing Food Policy Committee.

II. *Nutrition Surveys.*

1. *Mlalo Basin Area.*—The detailed nutrition survey of the Mlalo Basin area of the Usambaras, as part of the rehabilitation scheme, was completed by a final quantitative survey during April-May during which a number of school children were examined for signs of nutritional ill-health. It is hoped to publish the full report.

Clinical examination showed that the people were suffering from an insufficiency of protein or certain amino-acids and vitamins of the B2 complex, the most prevalent sign being inelastic or "crackled" skin over the shins, together with ulcers or healed ulcer scars. Photophobia appeared to be common. This evidence was supported by analysis of the food consumption data which showed very low value for the B2 vitamins and a low intake of protein which was mainly of poor biological value.

Follicular keratosis which is usually associated with vitamin A deficiency and possibly also with insufficient ascorbic acid was fairly prevalent amongst the adolescent boys, though only to a mild degree and not coupled with any visible eye changes. The high intake of carotene during the pumpkin season and the probable high intake by the children in the guava season possibly allowed sufficient storage of this vitamin in the body to prevent the appearance of deficiency signs except under stress such as of rapid growth.

Although the calcium in the diets was outstandingly low the incidence of caries was slight and usually confined to one or two teeth. This contrasts with the high incidence of caries among Dar es Salaam School children who tend to have more calcium in their diets owing to the consumption of fish.

The intake of iron although theoretically ample, being of the order of 20 mg. per head per day, was evidently not enough to replace losses resulting from the prevalent parasitic infections such as malaria and hookworm, since anæmia was common.

The general conclusions reached were that the general state of nutrition of the people was poor and that they relied too much on maize and beans for their diet although many kinds of food could be grown. The basic cause of the inadequate diet was ignorance of the value of foods, particularly fruit and green vegetables.

Consumption of animal products; meat, fish, eggs and milk was limited to a small proportion of the community, mostly wage earners, although the introduction of cattle markets has resulted in an increasing number of cattle being slaughtered. There is a prime need for linking up agricultural propaganda with the nutritional aspect of preventive medicine.

2. *Makonde Plateau.*—A similar survey, although limited to one period of the year, was carried out on the Makonde plateau. This district at an altitude of about 2,500 feet, is very fertile and large quantities of food crops are grown for sale. There are no rivers and the people are very short of water and have to spend a great deal of time and energy in fetching water from the wells below the plateau.

A large number of tropical ulcers were reported from this area particularly during the wet season. Clinical examination of the school children showed a lower incidence of inelastic and "crackled" skins than was found in the Mlalo survey. This might have been a reflection of the greater variety of staple cereal used in Newala District, i.e. sorghum, maize and rice, and the use of beer made with sprouted grain which was drunk in the sweet form by children as well as adults, whereas in the Mlalo District the beer was made from honey or sugar cane and was not drunk by the children. Signs of B2 complex deficiency were however present and both riboflavin and nicotinic acid values of the diet excluding beer were low. During the wet season the people relied on cassava and wild tubers for their staple food rather than cereals.

Very slight signs of vitamin A and C deficiencies were found, and the consumption of fruit and green vegetables was again inadequate at least during the dry season.

The calcium level of the diet was low as in Mlalo, but in contrast to Mlalo the incidence of dental caries in the Newala District was very high although in both places the water was soft.

The consumption of animal products was more universal than in the Mlalo District although there were no cattle, since there was a regular sale of dried fish from the Rovuma river which nearly all could afford to buy. The amounts eaten per head however were too small to make much contribution to the diet. Goats were kept but rarely eaten or milked.

III. *Institutional Dietaries.*

Schools.—The diet scales of several schools were analysed and recommendations for improvement made where necessary.

Prisons.—Following outbreaks of pellagra in prisons in the Western and Central Provinces, a special investigation was made at Dodoma prison where 48 cases had been reported. Analysis of the diet the prisoners were actually receiving showed that it was not inadequate and differed from the regular prison scale only in the omission of groundnuts for which extra beans and fat were substituted, and in the failure to provide a change of staple cereal on two days a week. It was thought that the reason for the pellagra may have been an overloading of the diet with whole ground maize meal without the compensation of groundnuts to give a high level of nicotinic acid in the diet. In view of the fact that only a relatively small proportion of the prisoners got the disease it seems that there was some other factor such as improper absorption or utilization of food involved, possibly as a result of previous malnutrition.

IV. *Groundnut Protein Meal Trials.*

1. *African Girls' School.*—Groundnut protein meal supplied by favour of U.A.C. Ltd. was given to the children of the African Girls' School in Dar es Salaam in the form of thin porridge, mixed with equal quantities of maize meal as part of a light meal the girls were given on arrival at school. The girls were all examined for signs of nutritional ill-health at the beginning of the groundnut meal trial and again three months later.

No observable effect was obtained which was probably due to the fact that the original nutritional status of the children was fairly good and partly to the fact that the supplementary meal was not a concentrated source of the many factors likely to be deficient in the home diets (e.g. vitamin A, riboflavin).

The meal will have undoubtedly benefited some of the children, and the trial was a useful indication of the possibility of introducing a new form of foodstuff into school diets.

2. *Hospitals and Clinics.*—In the native hospital in Dar es Salaam groundnut protein meal mixed with equal parts of maize meal and made into stiff porridge as the staple food was not accepted by the patients. However, in the same proportions and made into thin porridge it was appreciated as part of the light diet given to the very sick patients.

The meal was issued to mothers attending a Maternity and Child Welfare Clinic who were given instructions as to how to use it. It was popular among both mothers and children and even those who were suspicious of it at first came back for more and welcomed the change in their diet.

V. *Educational and Advisory Work.*

A talk on nutrition was given to a group of African social welfare officers, who were given a paper on nutritional propaganda for distribution in the welfare centres.

A new syllabus of nutrition for the African medical students' courses was drawn up with special reference to the use and values of local foodstuffs.

Dar es Salaam,
21st November, 1949

HILARY M. DEWEY,
Nutrition Officer

Appendix IV.

ANNUAL REPORT OF THE MEDICAL LABORATORIES, 1949

STAFF

Senior Pathologist : D. A. Skan.
Pathologists : J. P. Mackey ; F. Vivarelli.
Superintendents : C. Marshall ; F. C. Lane ; R. C. Telling.
Laboratory Assistants : 22.
Microscopists : 24.
Clerks : 3.

Dr. J. P. Mackey, proceeded on leave on 23rd July.
Mr. R. C. Telling, left on resignation on 31st August.
Dr. D. A. Skan, was seconded for duty at Medical Headquarters from 23rd August until the end of the year.
Mr. F. C. Lane, returned from leave on 13th September.
Dr. Vivarelli, arrived on first appointment on 3rd June.

OFFICIAL JOURNEYS

The Senior Pathologist visited Tanga, in February and June and Tabora, in April and October. In June he went to Nairobi as a member of a committee of enquiry into the breakdown of biological products at the East Africa Veterinary Research Organization Laboratory at Kabete.

POSITIVE LABORATORY FINDINGS RETURNS JANUARY—DECEMBER, 1949

MEDICAL LABORATORY, DAR ES SALAAM

CLINICAL PATHOLOGY AND PARASITOLOGY

1. URINE.

Total number of specimens examined	**1,651**
Albumen positives	534
Sugar positives	35
Acetone bodies positives	11
Casts positive	47
R.B.C. positives	135
Pus positives	520
Bile pigment positives	20
Tubercle bacilli positives	0
Schistosoma hæmatobium positives	23
Other findings, Bile salts	5
Spermatozoa	5

2. FÆCES.

Total number of specimens examined	**2,223**
Occult blood positives	18
R.B.C. positives	194
Pus positives	456
Ascaris ova positives	24
Oxyuris ova positives	7
Hookworm ova positives	91
Strongloides larvæ positives	15
Schistosoma mansoni ova positives	0
Tænia ova positives	6
Tænia saginata segment positives	4
Tænia solium segment positives	0
Entamœba histolytica cysts positives	5
Entamœba histolytica free forms positives	2
Balantidium coli positives	1
Giardia lamblia positives	1
Other findings:	
Trichuris Trichuria	30
Flagellates	5
Charcot leyden crystals	3

3. BLOOD FILMS.

Total number of films examined	**4,389**
Malarial parasites positives	386
Spirillum duttoni positives	26
Trypanosomes, positives	1
Wuchereria bancrofti positives	1
Perstans positives	0
Other findings	0

4. C.S.F.

Total number of routine examinations	**74**
Pandy's Test	21
Cell count	28
Chlorides	6

5. SPUTUM.

Total number of specimens examined	**228**
Tubercle bacilli positives	39

6. NASAL SMEARS.

Total number of specimens examined	**7**

7. URETHRAL AND VAGINAL SMEARS.

Total number of specimens examined	**255**
Gonococci positives	81

8. PUS AND BODY FLUIDS.

Total number of specimens examined	**28**

9. DARKGROUND EXAMINATIONS.

Number of specimens examined	**16**
Positives for *Treponema pallidum* (*pertenue*)	3

HÆMATOLOGY.

Total number of examinations	**1,831**
1. Hæmoglobin estimation	650
2. Red cell counts	250
3. White cell counts	197
4. White cell differentials	194
5. Reticulocyte counts	61
6. Sedimentation rates	81
7. Blood grouping	140
C.V.	58
M.C.V.	94
M.C.H.C.	93
Rh. Factor	11
Platellate count	1
Volume Index	1

ANNUAL RETURN OF SPECIMENS—SEWA HAJI HOSPITAL LABORATORY, 1949

Mr. Justine Mungia in charge assisted by Raphael Mwiseku and three Microscopists.

Twenty-eight thousand, three hundred and sixty-four specimens were examined during the year, the majority being routine examinations on hospital patients. The more significant findings are tabulated below.

Blood Films.

Total number examined	**7,803**
Malaria parasites present	2,705
Spirillum duttoni present	89
M. Filaria Perstans positive ...	38

Urine.

Total number examined	7,885
Albumen positive	2,135
Sugar positive	58
Acetone bodies positive	29
Casts positive	103
R.B.C. positive	1,697
Pus positive	2,656
Bile pigment positive	51
Schistosoma hæmatobium positive...	1,192

Fæces.

Total number of specimens examined	**7,132**
Occult blood positive	16
R.B.C. positive	953
Pus positive	797
Ascaris ova positive	726
Oxyuris ova positive	7
Hookworm ova positive	2,387
Strongyloides larvæ positive ...	710
Schistosoma mansoni ova positive ...	24
Tænia ova positive	31
Tænia saginata segment positive ...	8
Entamœba histolytica cysts positive	75
Entamœba histolytica free forms positive	27

C.S.F.

Total number examined	**178**
Meningococci positive	14
Other bacteria positive	56

Sputum.

Total number examined	**852**
Tubercle bacilli positive	78

Nasal Smears.

Total number examined	**93**
B. Lepræ positive	13

Urethral and Vaginal Smears.

Total number examined	**2,256**
Gonococci positive	1,675

Pus and Body Fluids.

Total number examined	**32**
B. anthrax	6
Staphylococci	5

Hæmatology.

Total number examined	**2,133**
Hæmoglobin estimation	2,133
Red cell counts	432
White cell counts	385
White cell differentials	385
Reticulocyte counts	47
Sedimentations rates	44

TANGA LABORATORY

With the exception of the Headquarters Laboratory in Dar es Salaam, Tanga is the only centre with a claim to a clinical Laboratory. This Laboratory had been in existence for many years under the charge of African Laboratory Assistant, John Mkande, but on the appointment of Dr. Vivarelli as Pathologist on June 3, he assumed charge of the Laboratory with Mr. Mkande as his chief Assistant. During the latter half of the year considerable progress has been made in developing and extending the scope of its activities. For the present, owing to lack of equipment, its function has been mainly confined to clinical pathology but later the sections of bacteriology and morbid histology are expected to become part of the normal routine of the Laboratory.

STATION : TANGA

LABORATORY RETURNS FOR THE YEAR 1949

Clinical Pathology and Parasitology

1. Urine.

Total number of specimens examined	7,885
Albumen positive	2,364
Sugar positive	255
Acetone bodies positives	10
Casts positives	209
R.B.C. positives	1,832
Pus positives	982
Bile pigment positive...	39
Tubercle bacilli positives	0
Schistosoma hæmatobium positives	1,096
Other findings—G.C.	20

2. FÆCES.

Total number of specimens examined	9,245
Occult blood positives	18
R.B.C. positives	309
Pus positives	208
Ascaris ova positives	440
Oxyuris ova positives	7
Hookworm ova positives	3,750
Schistosoma mansoni	39
Strongyloides larvæ positives	440
Tænia ova positive	75
Tænia solium segment positives	2
Tænia saginata segment positives	0
Entamœba histolytica cysts positives	45
Entambœba histolytica free forms positives	73
Balantidium coli positives	5
Giardia lamblia positives	36
Other findings :	
E. coli cysts	29
Trichuris ova	217

3. BLOOD FILMS.

Total number of films examined	**8,204**
Malaria parasites positives	1,979
Spirillum duttoni positives	9
Trypanosomes, positives	0
Wuchereria bancrofti positives	6
Perstans positives	17
Other findings	0

4. C.S.F.

Total number of routine examinations	**47**
Meningococci positives	6
Tubercle bacilli positives	0
Other bacteria positives—pneumococci	6

5. SPUTUM.

Total number of specimens examined	**2,550**
Tubercle bacilli positives	288

6. NASAL SMEARS.

Total number of specimens examined	**182**
B. lepræ positives	45

7. URETHRAL AND VAGINAL SMEARS.

Total number of specimens examined	**1,196**
Gonococci positives	399

8. PUS AND BODY FLUIDS.

Total number of specimens examined	**163**
Staphylococci positives	25
G.C. positives	6

9. DARKGROUND EXAMINATIONS.

Number of specimens examined	**0**
Positives for *Treponema pallium* (pertenue)	0

HÆMATOLOGY.

1. Hæmoglobin estimation	1,745
2. Red cell counts	202
3. White cell counts	307
4. White cell differentials	331
5. Reticulocyte counts	0
6. Sedimentation rates	3
7. Blood grouping	58

SEROLOGY.

1. Kahn test, number performed	3,031
Kahn positives	1,144
2. Widals. Number performed	205
Number showing significant agglutinations	50
3. Weil Felix, number performed	0
Number showing significant agglutinations	0

BACTERIOLOGY.

Total number of cultural examinations	30

HOSPITAL LABORATORIES

The number of investigations undertaken by hospital Laboratories in which trained Laboratory Assistants are posted is as follows :—

Maternity and Child Welfare Hospital, Dar es Salaam	4,567
Mwanza	29,037
Musoma	15,221
Bukoba	14,329
Tabora	29,117
Dodoma	9,108
Morogoro	12,424
Iringa	7,780
Mbeya	9,998
Lindi	10,767
Arusha	13.616
Moshi	17,402
Kigoma	4,967
Tanga	35,384

MEDICO LEGAL SECTION

Sixty-five autopsies were carried out on Coroners' Orders. The causes of death were : Homicide 7, Suicide 3, Accident 37.

Two men, 3 women, and 2 children were the victims of homicidal assault. Both children were slain by their respective parent. In the one case the child had been savagely hacked by a panga wielded by his mother and in the other, the father after practically severing the child's head, skilfully removed it's liver and heart in order to provide food for his next meal.

The 37 accidental deaths were caused by the following :—

Motor lorry accidents	13	Bicycle accidents	2
Drowning	7	Motor cycle accidents	1
Falls	4	Electrocution	1
Fire	3	Accidental poisoning	1
Crushing accidents	2	Gunshot wound	1
Railway accidents	2		

The race, sex and age distribution was as follows :—

European male adult	1	(gunshot wound).
Asian male adult	3	(lorry accident 1, bicycle accident 1, motor cycle accident 1).
Asian female adult	1	(fire).
Asian female children	2	(fire 1, killed by lorry 1).
African female adults	3	(drowning 1, railway 1, accidentally poisoned 1).
African children	1	(drowned).
African males	26	

It is interesting to note that in the majority of the fatal lorry accidents the victims were passengers. In no case was the driver involved.

Two African men and 1 African woman committed suicide by hanging.

Eighteen autopsies were performed on persons who had been found dead or had died suddenly from no apparent cause.

The causes of death were as follows :—

Birth Injury.
Tuberculosis 2.
Meningitis.
Gastric Ulcer.
Septic poisoning.
Heart failure following an earlier infarction.
Ruptured heart.
Cerebral hæmorrhage.
Acute septic infection.
Mitral stenosis.
Pneumonia 2.
Cirrhosis of liver.
Acute alcoholism.
Undetermined poisoning 3.

The 3 cases of apparent poisoning are of considerable interest specially as similar cases are constantly reported from all parts of the country and to the writer's knowledge were equally common in Nyasaland.

The 3 deceased (2 adult males and 1 adult female) together with 5 others (a man, a youth, a boy of about 8, a young woman and her child) took food together on February 9, at 12.30 p.m. The food consisted of dried fish, the fish being of a well known type, rice and coconut juice. The whole amount was consumed at this meal. The food was prepared by the deceased woman.

Although two members of the party complained of mild abdominal pain that same evening, acute symptoms commenced at approximately the same time in all cases on the following evening. Vomiting, pain and diarrhœa were the prominent symptoms. All were admitted to hospital.

In four of the patients, one man, the youth, the woman and the baby, the symptoms were mild after 48 hours mildly elevated temperature they made a complete recovery. The boy of eight years exhibited the same symptoms with elevated temperature but on February 14, that is five days after the suspected origin of the disease, he collapsed with subnormal temperature and failing heart. His condition remained serious for three days when improvement commenced which was maintained.

One of the deceased males exhibiting the same symptoms collapsed and died at 4 p.m. on February 12, the other male died at 1.50 p.m. on February 15.

In both cases postmortem examination revealed patchy hæmorrhagic erosions in the stomach and upper part of the small intestine.

The woman followed the same course with collapse on February 12. She, however, rallied and appeared to be recovering when on February 19 vomiting recommenced, the temperature rose and she died on February 22.

A postmortem examination immediately after death showed the following pathological conditions. The face was grossly swollen with œdema. There was free fluid in the abdominal cavity, the kidneys were enlarged and pale. The mucous membrane of the colon was œdematous, the lower ileum was atrophic and inflamed. In this case the actual and terminal cause of death was apparent. Microscopical examination revealed a degeneration of the tubular epithelium with blood and albuminous matter in the renal tubules. The glomeruli appeared normal.

In spite of repeated efforts and the use of modern selective and enrichment culture media no organisms of known food poisoning types could be isolated neither did the serum of any of the cases show diagnostic agglutination properties when tested against members of the genus salmonella. One case agglutinated *S. typhi murium* to a titre of 1/50 and another agglutinated a non-specific salmonella to a titre of 1/25 only. The boy agglutinated *B. newport* and a non-specific salmonella to a titre of 1/50.

From the blood, fæces, liver and kidney, *P. pyocyanea* was constantly isolated but it is considered unlikely that this organism was responsible for the symptoms and death. Chemical analysis for metallic poisons was negative.

A rumour had arisen that the poisoning may have been caused by crocodile bile but feeding experiments on monkeys and guinea-pigs revealed no toxic properties and there is no evidence in support of the belief that crocodile bile is poisonous in doses sufficiently small to be administered in food without the victims' knowledge.

The length of the incubation period, the febrile course of the illness and the postmortem signs are consistent with bacterial poisoning but are inconsistent with known types of vegetable and mineral poison.

POLICE EXHIBITS

One hundred and sixty-four exhibits or collections of exhibits were submitted for examination by the Police. These comprised :—

Garments for blood stains	56
Weapons for blood stains	53
Other exhibits for blood stains	31
Garments for seminal stains	8
Collections of bones	8
Collections of human remains	8

One specimen showed features of interest. An African brain with a large hæmorrhage in the cerebrum which had ruptured into the lateral ventricle. The history is as follows :—

A young adult African male was involved in a scuffle during which he was struck in the mouth by a fist. The blow was not particularly severe and the victim did not fall. Twenty-four hours later he complained of headache and dizziness and was admitted to hospital where he lapsed into a coma and died shortly afterwards. Histologically there was an advanced atheroma of the cerebral vessels.

The points of interest are the rarity of this type of lesion in the young African and secondly the Medico legal question as to how far if at all the blow was responsible for the fatal hæmorrhage. The assailant was accused of manslaughter but was acquitted.

BACTERIOLOGICAL AND SEROLOGICAL SECTION, 1949

A feature of the work undertaken during the year by the bacteriological section was the general increase in the demand for routine bacteriological examinations. The increase is shown in Table I.

TABLE I

Type of Examination	Year 1948	Year 1949
General Bacteriology	1,221	2,358
Bacteriological Examination of Water	657	765
Wassermann and Kahn Tests	3,560	4,081
Agglutination Tests (Widals, etc.)	444	453

Under the term "General Bacteriology" in Table I a fall occurred in the number of cerebro-spinal fluids submitted, but there was a marked increase in stool examinations and blood cultures, which is illustrated in Table II.

TABLE II

General Bacteriology	Year 1948	Year 1949
Blood Cultures	141	289
Fæces	372	1,129
Cerebro-Spinal Fluids	91	34
Swabs—Vaginal, Cervical and Urethral	66	136

Of particular interest was the increase in the number of organisms of the Salmonella group isolated. There is little doubt that there is a wide-spread reservoir of infection in Dar es Salaam. In this connection, it was considered that in view of the large consumption of eggs by the community this might prove to be a source of infection. An investigation however yielded no information, as no Salmonella organisms were isolated from about eighty eggs examined. On the other hand, there were a number of salmonella isolated from apparently healthy people. The most striking case being a suspected typhoid carrier—an askari—from whom daily specimens were cultured over three weeks, and on three occasions a different type of Salmonella was isolated : two from stools and one from urine. These findings are in agreement with current investigators who consider that about three per cent of apparently healthy persons may harbour the organisms. Such being the case, this may be the explanation for the frequent infections which occur in Dar es Salaam, where the sanitary conditions and the hygiene of many of its inhabitants leave much to be desired.

With the departure on vacation leave in July and August of the Pathologist and the Laboratory Superintendent in charge of the bacteriological section, it was decided not to attempt the typing of the salmonella strains isolated, as the identification of a salmonella is unimportant from the patient's point of view. Only in the event of an epidemic would the identification be regarded as important.

The systematic training of the African Laboratory Assistant Students was maintained. The value of this training is evident in the delegation of more responsible duties to the fully trained Africans.

Salmonella Infections.

Typhoid was again the commonest enteric infection in Dar es Salaam during the year.

Salm typhi was isolated from twenty different cases. From one of these the organism was cultured from the content of an abdominal cyst. Clinical details were lacking. The patient—an Asian girl, age six—became ill with abdominal symptoms on 25th June, was operated on 31st July, and the cyst containing pus was removed.

There were nineteen types of Salmonella isolated. *Salm Poona* was isolated by blood culture from an African child who had a swinging temperature for eight days. There were three new strains isolated which provisionally have been given the names of the localities in which they were found.

During the period when the typing of the Salmonellas was not done eighteen Salmonella organisms were isolated. Cultures of these have been retained in the hope that it may be possible, when the staff position improves, to have them typed.

The Laboratory is again indebted to Dr. Joan Taylor of the Salmonella Reference Laboratory, London, for the final serological identification of the Salmonella organisms.

Bacillary Dysentery.

There was a considerable increase in the isolation of typical dysentery bacilli from cases of clinical dysentery. Comparative figures reveal that there were 159 isolations compared with 44 in 1948. Apart from *Sh. sonne* and *Sh. flexner* there were twenty-one *Sh. schmitzi* isolated. Also cultured were one *Sh. Shigæ* and two strains of *Sh. boyd*, which are the first recorded cases in Tanganyika. The former was isolated from a case at Morogoro. From one case of clinical dysentery an organism of the Salmonella group was isolated together with *Sh. flexner.*

Diphtheria.

C. diphtheriæ was isolated from four cases of diphtheria, none of which was a European. Three of the strains were of the *mitis* type, and the remaining one was an *intermedius* strain. All strains proved virulent to guinea-pigs.

One *mitis* strain isolated from an Asian child who had a sore throat proved avirulent to a guinea-pig. It is not known whether the child developed symptoms of diphtheria.

Septic Meningitis.

In thirty-four cerebro-spinal fluids examined there were five cases of septic meningitis due to *Streptococcus pnuemoniæ* and one from which the mengingococcus was cultured. All these cases were Africans. No other organisms were seen or isolated in specimens from cases of septic meningitis.

Typing of M. tuberculosis.

Six typing examinations were undertaken on specimens submitted by the Medical Specialist, Tuberculosis Hospital, Kibongoto. In four of the specimens the organisms proved to be of the *Human* strain ; the other two were negative.

Foodstuffs.

Two samples of canned foodstuffs and one sample of cod liver oil and malt were received from the Medical Officer of Health for examination. These were reported as "virtually"—sterile.

Waters.

The increase in the number of water samples examined is attributed mainly to the drought conditions which necessitated stricter bacteriological control of the water supplies, particularly in the up-country areas.

Wassermann and Kahn Tests.

As it was not possible to obtain guinea pigs locally with a satisfactory competent titre, it was necessary to obtain complement from England throughout the year. Although on occasion it was found that the imported complement gave low titres, it was nevertheless possible to maintain the performance of the Wassermann test in parallel with the Kahn test. The number of sera examined by both tests was 3,605, and there was eighty-eight per cent agreement.

Agglutination Tests (Widals).

The introduction of a special laboratory form for agglutination tests requesting relevant details of the clinical history of the patient facilitated the interpretation of the agglutination results, particularly in those cases with no previous history of inoculation or infection, and also enabled a more considered opinion to be given in assessing the agglutination reading from patients with previous inoculations.

D. A. Skan,
Senior Pathologist

ANNUAL RETURN OF SPECIMENS—BACTERIOLOGICAL AND SEROLOGY, 1949

Appendix 1.

Bacteriology

Blood Cultures.

Total number examined	**289**
Salm. typhi isolated from	26
Salm. Poona isolated from	1
Salm. Uzaramo (new strain provisional name)	1
Streptococcus pyogenes isolated from	1
Staphylococcus pyogenes isolated from	1
Streptococcus viridans isolated from	2
B. fæcalis alkaligenes isolated from	17
Ps. pyocyanea isolated from ...	5

Fæces.

Total number examined	**1,129**
Salm. typhi isolated from	13
Salm. heidelburg isolated from ...	14
Salm. typhi murium isolated from ...	2
Salm. durban isolated from ...	1
Salm. anatum isolated from ...	1
Salm. urbana isolated from ...	2
Salm. kottbus isolated from ...	4
Salm. brœnderup isolated from ...	2
Salm. kisangani isolated from ...	1
Salm. chandans isolated from ...	1
Salm. montevideo isolated from ...	2
Salm. newport isolated from ...	2
Salm. Senftenberg isolated from ...	2
Salm. poona isolated from	2
Salm. Zanzibar isolated from ...	1
Salm. hvittingfoss isolated from ...	1
Salm. mikawasima isolated from ...	1
Three new strains (provisional names below)	
Salm. Lindi isolated from	2
Salm. Uzaramo isolated from ...	1
Salm. ndoro isolated from	1
Salmonella unclassified	18
Shigella flexner isolated from ...	60
Shigella sonne isolated from ...	65
Shigella schmitzi isolated from ...	18
Shigella shigœ isolated from ...	1

Urine (for enteric organisms).

Total number examined	**43**
Salm. typhi isolated from	1

Urine (for pyogenic organisms).

Number examined	**310**
B. coli isolated from	85
Ps. pyocyanea isolated from ...	16
B. fæcalis alkaligenes isolated from	26
Streptococcus fæcalis isolated from	6
Staphylococcus pyogenes isolated from	1
Streptococcus pyogenes isolated from	1
Paracolon bacillus isolated from ...	5

Swabs—Throat and Nose.

Total number examined	**132**
C. diphtheriæ (mitis) isolated from	4
C. diphtheriæ (intermedius) isolated from	1
Streptococcus viridans isolated from	25
Streptococcus pyogenes isolated from	20
Streptococcus pneumoniæ isolated from	1
B. friedlanderi isolated from ...	1
Staphlococcus pyogenes isolated from	3

Swabs—Vaginal, Cervical and Urethral.

Total number isolated	**136**
Streptococcus pyogenes isolated from	14
Streptococcus viridans isolated from	24
Staphylococcus pyogenes isolated from	5
B. proteus isolated from	3
N. gonorrhœae isolated from ...	1
Ps. pyocyanea isolated from ...	3

Swabs—Conjuctival.

Total number isolated	**81**
Staphylococcus pyogenes isolated from	10
B. proteus isolated from	1
B. friedlanderi isolated from ...	2
B. coli isolated from	2

ANNUAL RETURN OF SPECIMENS—BACTERIOLOGICAL AND SEROLOGY, 1949—(*contd.*)

Swabs—Skin Ulcers.

Total number examined	**12**
Staphylococcus pyogenes isolated from	1
Ps. pyocyanea isolated from	1
Streptococcus viridans isolated from	1

Pus.

Total number examined	**52**
Staphylococcus pyogenes isolated from	21
Ps. pyocyanea isolated from	5
Streptococcus pyogenes isolated from	2
Streptococcus viridans isolated from	2
B. friedlander isolated from	1
B. coli isolated from	1
Pus from abdominal cyst—*Salm typhi*	1
Paracolon bacillus isolated from	1
Tubercle bacilli (direct finding)	2

Cerebro-spinal Fluid.

Total number examined	**34**
Meningococcus isolated from	1
Streptococcus pneumoniæ isolated from	5

Pleural Fluids.

Total number examined	**20**
Streptococcus pneumoniæ isolated from	1
B. fæcalis alkaligenes isolated from	1
Streptococcus viridans isolated from	1

Joint Fluids.

Total number examined	**12**
Streptococcus viridans isolated from	1

Glands for T.B. typing.

Total number examined	**6**
Human strain isolated from	4
Negative	2

Sputa.

Total number examined	**4**

Miscellaneous.

Total number examined	**101**
Beast milk? salmonella	2
Exposure plates for *Streptococcus pyogenes*	6
Eggs and shells? salmonella	80
Dust for *Streptococcus pyogenes*	1
Vomits? organisms for food poisoning	6
Cultures from spleens, liver and kidneys	7
Moribund Fowls:	3
Salm. urbana isolated from	1
Salm. heidelberg isolated from	1

Bacteriological Examination of Water.

Total number examined	**765**
Dar es Salaam Main Supply, number examined	640
Other Sources, number examined	125

Total number of Specimens Submitted for Bacteriological Examinations **3,126**

Biological Examination (Guinea Pigs) Examination for T.B.

Total number of examinations	4
Negative	4

Diphtheria Virulence Tests.

Total number examined	4
Positive	3
Negative	1

Routine Rat Examination for *P. pestis*.

Total number examined	**2,952**
Negative	2,952

Appendix 2.

WASSERMANN AND KAHN REACTIONS

(a) *Sera examined by both Wassermann and Kahn Tests.*

Number of sera examined **3,605**

W. & R. Positive / Kahn Positive 925

W. R. Negative / Kahn Negative 2,199

Table I shows the agreement between Wassermann and Kahn Tests on 3,605 sera.

TABLE I

		Wassermann		
		Positive	*Doubtful*	*Negative*
Kahn	Positive	925	46	282
	Doubtful	15	10	98
	Negative	25	15	2,199

The agreement between the Wassermann and Kahn Tests was approximately eighty-eight per cent.

(b) *Sera examined by Kahn Test only.*

Number of sera examined ...	325
Positive	140
Negative	168
Doubtful	17

(c) *Sera examined by Wasserman Test only.*

Number of sera examined ...	54
Positive	16
Negative	34
Doubtful	4

(d) *C.S.F. examined by Wassermann Test.*

Number of C.S.F. examined ...	87
Positive	17
Doubtful	3
Negative	67

Total number of sera and cerebro-spinal fluids examined by Wassermann and Kahn reactions **4,081**

Agglutination Tests (Widals).

Total number of specimens examined **453**

Presumptive positive results :—

Typhoid	110
Paratyphoid A	3
Brucellosis	7
Tick typhus	7
Negative	326

Paul Bunnell Reaction.

Number of specimens examined...	2
Positive	1

Grand Total of Examinations ... **10,622**

A LABORATORY STUDY OF THE SALMONELLA AND SHIGELLA ORGANISMS ISOLATED IN DAR ES SALAAM, TANGANYIKA

By R. C. Telling, *Superintendent, Section of Bacteriology*

Introduction

The work to be presented in this paper was performed during the period March, 1947 to April, 1949 in the Government Medical Laboratory at Dar es Salaam, which is the main port and air terminus of Tanganyika in East Africa. The town of Dar es Salaam has a mixed population totalling about 70,000 of which approximately 2,000 are Europeans, 18,000 are Asians and the remainder Africans.

The Laboratory is the main pathological Laboratory of the medical services of Tanganyika (a country about three times the area of the United Kingdom) and is the only one in the Territory staffed and equipped to perform detailed bacteriological investigations. However, owing to the eccentric position of Dar es Salaam and the great distances between it and other townships, specimens for cultural examination are rarely sent to the Laboratory from other parts of the Territory. The majority of the isolations recorded in this paper are thus derived from cases which occurred in Dar es Salaam or its immediate neighbourhood.

Isolations of Salmonella—Shigella Organisms in Dar es Salaam, 1920-1948

A study of the available literature, including the Annual reports of the Medical Department of Tanganyika since 1920 yields little information of the types and prevalence of Salmonella and Shigella organisms occurring in Tanganyika, or in Dar es Salaam in particular. Reference is made to the isolation of about 40 strains of dysentery bacilli during the period 1920-1939, one of which was a *Sh. shigæ*, the remainder belonging to the Flexner group. Record was found of about 20 isolations of *Salm. typhi* and a few isolations of *Salm. paratyphi* A, but the diagnosis of Salmonella infections seems to have been made mainly on clinical grounds, aided in some cases by serological reactions.

In 1921, a *Salmonella*, which could not at that time be properly classified was cultured from the urine of a febrile patient. The antigenic structure of this organism was later determined by White (1926) and it was given the name of *Salm. Dar es Salaam.*

Technical Procedures

Examination of Fæces

In the period under review the laboratory examined 2,500-3,000 specimens of fæces annually, the greater number of which were submitted for a routine macroscopical and microscopical examination for intestinal parasites. Cultural examination for Salmonella-Shigella organisms was in fact requested for only a small percentage, perhaps ten per cent of the specimens, but as there was plenty of clinical evidence that enteric fever and bacillary dysentery were endemic in Dar es Salaam, stools which were submitted for the routine examination and which showed any mucus, blood or pus cells were subjected to a full cultural examination (see below). The remaining specimens sent for the routine investigation were inoculated on a $\frac{1}{3}$ or $\frac{1}{4}$ segment of a plate of desoxycholate-citrate agar (Hynes 1942), subsequently referred to as D.C.

Full cultural examination.—This consisted of direct plating on MacConkey agar (M.C.) and D.C., and inoculation into 5 ml. quantities of tetrathionate broth and selenite—F (Hobbs and Allison 1945). After overnight incubation, the enrichment media were subcultured on to segments of a D.C. plate. Whenever the provisional diagnosis was enteric fever, Wilson and Blair agar was included. If mucus was observed in the specimen, portions were selected and washed in peptone water before inoculation of the media.

The use of MacConkey agar was continued for the possible *Sh. shigæ* infection, because it has been reported that this organism is inhibited by desoxcholate medium (Ungar 1940). (The one strain of *Sh. shigæ* obtained was in fact isolated on M.C., the parallel D.C. plate showing no non-lactose fermenting colonies whatsoever).

For dysentery organisms, 1 oz. screw-capped bottles containing a few millilitres of buffered glycerine-saline (Sachs 1940) were issued in cases where delay in the submission of the specimens was likely to occur.

Identification of the Salmonella-Shigella organisms

Suspicious colonies were inoculated into tubes of peptone water in the morning, and after about six hours incubation were sub-cultured to tubes of mannitol, glucose and a sucrose-salicin-lactose agar slope (S.S.L.) (Rolfe 1946)—the slope being inoculated last with a single stroke of the loop.

If after overnight incubation the S.S.L. slope showed acid production or pigmentation due to *Ps. pyocyanea*, or the spreading growth of B. proteus, the strain was discarded as non-pathogenic.. In the absence of any of these characteristics, and if glucose only, or both glucose and mannitol were fermented, the organism was examined for motility and indole production.

Organisms giving the reactions of either the Salmonella or Shigella groups were tested on slide with the appropriate antisera, and any positive agglutinations were confirmed by tube tests. For the identification of the dysentery bacilli, the following "Standards Laboratory" antisera were available :—Shiga, Schmitz, Sonne, Polyvalent Flexner and the six individual Flexner sera, and Polyvalent Boyd and the three individual Boyd sera, 170, 288, and DI. Strains of *Salmonellæ* were identified as far as possible with the diagnostic antisera available, and with the exception of strains of *Salm. typhi, Salm. paratyphi* A, and an organism of *Salm. newport* type, were all sent to the Salmonella Reference Laboratory, Colindale, London, for confirmation or identification.

The bacterial suspensions for the tube agglutinations were prepared as follows :—

Salmonella

(a) *Flagellar suspension.*—To an overnight broth culture of the organism, 4-5 drops of neat formalin were added. After shaking, the culture was diluted with saline to an appropriate density.

(b) *Somatic suspension.*—The overnight growth of the organism on an agar slope was scraped off in 1 ml. of saline and transferred to another tube. To this was added 7 ml. of absolute alcohol. This was mixed by drawing up and down with pasteur pipette and then allowed to stand for 5 minutes. After centrifuging, the deposit was resuspended in saline to an appropriate density.

Shigella

To prepare the dysentery suspensions, two solutions were required—

(1) Stock mercuric iodide solution

Mercuric iodide	1 gm.
Potassium iodide	4 gm.
Distilled water	100 ml.

(2) Buffered formal-saline

2 per cent formalin in saline was brought to pH 7·4 with di-sodium hydrogen phosphate.

For use, 10 ml. of solution 1 was diluted to 100 with saline and 2·5 ml. of solution 2 was added. The overnight growth of the organism on an agar slope was emulsified and diluted to the required opacity with this final solution.

SALMONELLA

Results

Salm. typhi.

During the period under review 28 cases of typhoid were confirmed by bacteriological methods. Five were confirmed by the isolation of the organism from both blood and fæces, nine by blood culture alone, and nine by isolation from the fæces alone. In one instance *Salm. typhi* was isolated from an empyema, and in four fatal cases the organism was cultured from the spleen after post-mortem.

The racial distribution was as follows—

Twenty-two Africans, five Asiatics and one European. In only one case, an Asian, could it be definitely established that infection had not occurred in Dar es Salaam.

Sera for agglutination reactions were received from ten cases with no previous history of enteric fever or T.A.B. inoculation. In nine of these cases diagnostically high titres of agglutination, or significant rises in titres were demonstrated as shown in *Table I.*

TABLE I

	First Widal		Second Widal		Bacteriological Confirmation
	"H"	"O"	"H"	"O"	
1.	1:50	1:50	1:250	1:250	Blood Culture.
2.	—ve	—ve	1:5120	1:5120	Culture from spleen.
3.	—ve	—ve	1:250	1:250	Blood Culture.
4.	1:640	1:1280	None submitted		Blood Culture.
5.	1:250	1:250	,,	,,	Culture from spleen.
6.	1:320	1:320	,,	,,	Fæces.
7.	1:640	1:80	,,	,,	Blood Culture.
8.	1:320	1:125	,,	,,	Blood Culture.
9.	1:320	1:320	,,	,,	Fæces.

The atypical case was an adult Asian whose serum showed only flagellar antibody response. When first examined some fourteen days after the onset of pyrexia, his serum agglutinated *Salm. typhi H* suspension to a dilution of 1 :1280, but this titre fell to 1 :160 eight days later. No agglutination of the somatic suspension of *Salm. typhi* was obtained with either specimen but the second serum was found to agglutinate with *Salm. typhi Vi* suspension to 1/20. Bacteriological confirmation of active infection was obtained by blood culture.

During the investigation the value of continuing incubation of blood cultures up to sever days for the isolation of the typhoid bacillus was well illustrated. The method of culture wa the injection of 10 ml. of blood into 100 ml. of meat infusion broth containing 0·005 per cen p. aminobenzoic acid and gentian violet to a final concentration of 1 :250,000. Sub-culture were made on to D.C. or M.C. at intervals of 24 hours, three, five and seven days. *Table II* shows the results obtained.

TABLE II

Number of Specimens	*–ve 24 hours*	*–ve 24 hours +ve 3 days*	*–ve 3 days +ve 5 days*	*–ve 5 days +ve 7 days*
9	2	2	3	2

Salm. paratyphi A and *Salm. paratyphi B.*

Only two cases of paratyphoid fever were confirmed bacteriologically, one being a paratyphoi A, and the other a paratyphoid B. The former occurred in an Italian, who was known t have been infected up-country. He was sent to Dar es Salaam for hospitalization and specifi diagnosis, and *Salm. paratyphi A* was isolated from several specimens of fæces. The case o paratyphoid B was a European child of one year old who had resided in the tropics since he birth, and who a few weeks prior to her illness had accompanied her parents on "safari" up-country. Her illness developed shortly after her return to Dar es Salaam, so that infectio most probably occurred during the "safari". *Salm. paratyphi B* was cultured from numerou specimens of stools over a period of five weeks.

Salm. adelaide.

This organism was isolated from the fæces of a European male, aged 34 years, who ha mild afebrile diarrhœa for four days. The *Salmonella* was isolated after enrichment throug both selenite F and tetrathionate broth from a stool which showed no abnormalities.

Salm. adelaide was first described by Atkinson (1943), and was isolated from four cases of gastro-enteritis in England in 1943 (M.R.C. Special Report Series 260). It has also been isolated from three cases of gastro-enteritis and three asymptomatic carriers in the United States (Edwards, Bruner and Moran, 1948). The four strains isolated in England differed from the one isolated in Australia in that they fermented sorbitol. The Dar es Salaam strain was found to produce acid and gas in sorbitol in twenty-four hours.

Salm. anatum.

This *Salmonella* was cultured from the stool of a middle-aged European woman who had diarrhœa and a slight, but persistent pyrexia, the duration of which could not be accurately ascertained. The organism was isolated only after enrichment through selenite-F from a watery stool which showed no other abnormality.

Salm. brœnderup.

Salm. brœnderup was isolated from a male European aged 32 years, who had acute diarrhœa, nausea and pyrexia for three days, following which a mild form of diarrhœa persisted for about a week. The *Salmonella* was cultured after enrichment through selenite-F from a specimen, which was loose and contained a few pus cells, taken during the period of mild diarrhœa.

Salm. chandans.

A septicæmic infection in a young adult African was found to be due to *Salm. chandans* (Williams and Telling, 1949). As far as is known this is the first recorded human infection due to this particular *Salmonella,* which was first reported in 1949 (Hinshaw and McNeil), when it was isolated from the intestine of a normal fence lizard in California.

The illness lasted five months, and was characterized by irregular pyrexia with initial jaundice and bouts of diarrhœa, followed by an empyema and pericarditis. *Salm. chandans* which has the antigenic formula of O = I. H = d, enx, was isolated from the blood fæces, pericardial fluid and pleural pus. Flagellar and somatic suspensions of the organisms were found to agglutinate with the patient's serum to titres of 1 : 1280 and 1 : 250 respectively.

The *Salmonella* was frequently cultured from the empyema, and after the patient had been ill for three months, mucoid colonies were observed in cultures made from the pleural pus. In films made from these mucoida colonies, the individual bacteria appeared coccoid but no encapsulation was observed. On first subculture to broth the organism was non-motile, and when motility was induced by passage through a Craige's tube, the colonies were found to revert to normal type. A somatic suspension of the mucoid strain would not agglutinate with the O antiserum of *Salm. aberdeen* (which contains somatic factor XI) unless the suspension had first been heated to 100° C. Biochemically, the mucoid strain differed from the normal colony only in the slow utilization of citrate—three days being necessary to show growth in the case of the mucoid strain.

Salm. newport type.

This *Salmonella* was cultured from the fæces of a European woman of 58 years of age, suffering from acute gastro-enteritis for four days. The stool from which the organism was isolated was mucoid with traces of blood and mucus. The *Salmonella* was obtained in pure culture on both M.C. and D.C. and was agglutinated to titre of 1 :250 by the H and O antisera of *Salm. newport,* and in phase 2 with the non-specific Salmonella I antiserum. Owing to an accident it was unfortunately not possible to send this strain for confirmation.

Salm. rubislaw.

This organism was isolated from the stool of a European baby of eight months, suffering from diarrhœa and pyrexia which lasted five days. The organism was isolated in large numbers by direct plating on M.C. and D.C. The stool specimen was loose and yellowish, and contained mucus, but showed no macroscopical or microscopical blood.

Salm. urbana and Salm. poona.

These two Salmonellæ were isolated from the same patient a European child aged three years, the son of the man from whom *Salm. brœnderup* was isolated. This child had two days diarrhœa and slight pyrexia, but no vomiting, about the same time as his father. When the *Salmonella* was obtained from the parent, a stool from the child was submitted, and *Salm. urbana* was cultured after enrichment through *selenite-F.* Another specimen of fæces was examined some fourteen days later and on this occasion *Salm. poona* was isolated after enrichment through tetrathionate broth.

Salm. waycross.

This bacillus was isolated from the stool of a five months old European baby suffering from acute gastro-enteritis which lasted three days. The organism was obtained in almost pure culture on both M.C. and D.C. from a specimen which was loose, blood-stained and contained large streaks of mucus. The case was of special interest because the child had only been on a "solid" diet for a week.

Salm. zanzibar.

Salm. zanzibar was cultured from the fæces of an adult European with afebrile diarrhœa, which lasted about three days. The organism was isolated by direct plating on M.C. and after enrichment through both selenite-F and Tetrathionate broth from a soft loose motion which showed no mucus or blood.

The organism was isolated again from the same patient about nine days later after enrichment in both fluid media. The stool specimen was formed, and no pus or red cells were seen microscopically.

New Types of Salmonella Isolated

Four *Salmonella* which could not be identified serologically with any known strains were isolated. These organisms are at present being studied in detail both at Dar es Salaam and the Salmonella Reference Laboratory, London, and will be reported in full at a later date. The names given to these strains in this paper are provisional.

Salm. "mgulani".

This organism was cultured from the stool of a 23 year old European living at Mgulani Transit Camp in Dar es Salaam. The man had abdominal pain, colic and diarrhœa with slight pyrexia (99·4°F.) for three days. His stools were watery and contained mucus which microscopically showed abundant pus cells and red blood cells. The organism was obtained in almost pure culture on both M.C. and D.C. Unfortunately it was not possible to test the organism against the patient's serum until four months later, when agglutination of a flagellar suspension occurred in a dilution of 1 :50, but not in 1 :125. There was no agglutination with the somatic suspension in a serum dilution of 1 :25.

Salm. "lindi".

This *Salmonella* was isolated from an adult European woman residing in Lindi, a coastal town some 200 miles south of Dar es Salaam. She had suffered from diarrhœa and slight pyrexia (99·2°F.) for about a month. The organism was isolated after enrichment through both selenite-F and tetrathionate broth from a watery stool which microscopically showed a few pus cells.

Salm. "uzaramo".

This *Salmonella* was isolated from the blood and fæces of a young African who had an enteric-like illness for about a month. The organism was cultured from the fæces after enrichment through selenite-F and tetrathionate broth, and was obtained from the blood culture after three days incubation. Rising titres of agglutination of the organism by the patient's serum were demonstrated, as shown in *Table III.*

TABLE III

Days of Illness	*Flagellar Suspension*	*Somatic Suspension*
15	—ve	—ve
20	—ve	—ve
26	1 :125	—ve
29	1 :250	1 :25

The patient recovered and was discharged on the 29th day. Throughout the illness the man's serum agglutinated to high titres (1 : 2560) both a non-specific Salmonella suspension and a *Proteus* OX19 suspension. No evidence could be obtained of any previous typhus-like infection, and the agglutination of the non-specific Salmonella is considered to be probably due to non-specific stimulation of residual agglutinins from a previous Salmonella infection.

Salm. "ndoro".

This strain was isolated from the fæces of an African of the Ndoro District of Lindi who clinically was suffering from enteric fever. No typhoid bacillus was isolated from the stool specimen, but another organism of the Salmonella group was cultured in selenite-F broth. The patient's serum failed to agglutinate this *Salmonella*, but did agglutinate standard suspensions of *Salm. typhi* H and O to titres of 1 :250 and 1 :125 respectively. Unfortunately it was not possible to obtain any further specimens because the patient recovered and was discharged. However as there was no history of a previous typhoid illness or T.A.B. inoculation it seems probable that the case was a true typhoid infection, and that the *Salmonella* isolated was not causative.

DISCUSSION

From these results it is apparent that during the period March, 1947, to April, 1949, *Salm. typhi* was the commonest cause of Salmonella disease in Dar es Salaam. The marked increase in the number of isolations of this organism cannot be said to indicate a real increase in the number of typhoid cases, but rather to reflect the effect of the introduction of modern selective and enrichment media into an area where a clinical typhoid is known to be endemic.

Only two cases of paratyphoid fever were detected and neither of these was infected in Dar es Salaam. Judging by the results of Widal examinations on sera received from all parts of Tanganyika, this comparative infrequency of paratyphoid exists throughout the Territory. During the period under discussion, 822 sera were examined, and of these 139 were presumptive positive of typhoid; only 6 were presumptive positive of paratyphoid A, and none of paratyphoid B.

The number and variety of the other Salmonella isolated, many of which are uncommon, and some of which are new, is of interest and importance. There is no reason to suppose that these were suddenly introduced into Dar es Salaam in 1947, and it is considered that the frequency of their isolation must once again be attributed to the introduction of culture media selective for the growth of the intestinal pathogens of the Salmonella type.

Intestinal disturbances of a mild nature are fairly common amongst all peoples residing in the tropics, and it is certain that medical treatment is not sought on every occasion. Europeans suffering from diarrhœa or mild enteritis who do seek treatment generally have specimens of stool examined bacteriologically, but this is not usually the case with the other races, who because of their numbers and the lack of medical staff, must of necessity be treated empirically. Only in severe infections in these people, such as occurred with *Salm. chandans* and *Salm. uzaramo* is it likely that detailed bacteriological investigation would be requested. This doubtless explains why the Salmonellæ associated with the milder clinical conditions were all isolated from Europeans, and it suggests that only a few of the milder infections due to Salmonella organisms in Dar es Salaam have been investigated.

It is curious that those cases which showed symptoms of the food-poisoning type were always "individual cases"; and were never associated with an "outbreak". This fact, when considered with the variety of strains isolated, would seem to suggest the existence of a large and widespread reservoir of Salmonella.

There can be little doubt that such medically undeveloped and hygienically backward countries as Tanganyika are fertile fields for the isolation of Salmonella organisms, and that the expansion of laboratory services in such countries must inevitably lead to even larger numbers of Salmonella types.

SHIGELLA

Results

Types and Frequency.

During the period March, 1947, to April, 1949, typical dysentery bacilli were isolated from the stools of 66 Europeans, 50 Africans and 3 Asians. Of these 119 strains, 118 were cultured from persons living in Dar es Salaam. The remaining bacillus, which was the only strain of *Sh. shigæ* isolated, was from a case of dysentery which occurred several hundred miles up-country from Dar es Salaam (*vide infra*).

The dysentery bacilli in Dar es Salaam fell into the three groups—Flexner, Sonne and Schmitz, and the frequency of their isolation is shown in *Table IV*.

TABLE IV

Type of Bacillus		*Number of Isolations*		*Percentage Frequency*
Flexner	...	68	...	58%
Sonne	...	37	...	31%
Schmitz	...	13	...	11%

Of the Flexner group of organism, *Sh. flexner* W occurred most frequently, accounting for 36 of the 68 strains of Flexner bacilli isolated. From Europeans, *Sh. sonnei* and the Flexner group of organisms were obtained in approximately equal proportions, but from Africans, *Sh. sonnei* accounted for only 18 per cent of the isolations compared with 68 per cent of Flexner bacilli. No strains of *Sh. boyd* were found.

Table V shows the frequency of the dysentery bacilli isolated and their racial distribution.

TABLE V

	Flexner						Sonne	Schmitz	Shiga	Total
	W	V	Z	103	88	Manchester				
Europeans ...	20	2	3	2	4	1	28	6	—	68
Africans	14	—	11	8	—	1	9	6	1	50
Asians	2	—	—	—	—	—	—	1	—	3
Total ...	36	2	14	10	4	2	37	13	1	119

Out of 155 stools which microscopically showed a bacillary dysentery exudate of abundant pus cells and red blood cells, typical dysentery bacilli were isolated from 80, thus giving a percentage frequency of isolation of about 51 per cent from such specimens.

Shigella shigæ.

The one strain of *Sh. shigæ* was isolated from an African during an investigation of what was loosely termed "a dysentery outbreak" in an African labour force on a sisal plantation some 200 miles inland from Dar es Salaam. There were about 70 cases in all with a mortality rate of approximately four per cent. Six specimens of fæces sent in buffered glycerine saline were examined and pus cells were found to be present in all of them. An intestinal pathogen (*Sh. shigæ*) was isolated from only one specimen.

An attempt at a retrospective diagnosis on the sera of a number of convalescent cases by agglutination tests with Salmonella and Shigella suspensions was not successful. Unfortunately detailed laboratory investigation into this outbreak was hampered by the indifferent means of communication available.

Atypical strains.

From four cases of clinical bacillary dysentery, gram-negative rods, which gave the biochemical reactions of the dysentery group were isolated in almost pure culture on D.C. and M.C. All four strains were non-motile on first isolation, and formed indole; two produced acid in glucose only, and the other fermented mannite. All strains were inagglutinable with the routine dysentery sera.

One case, an African laboratory assistant, was investigated further. The organism, which fermented both glucose and mannite, was isolated from two consecutive specimens of fæces, both of which contained much blood and mucus. After sulphaguanidine therapy the organism was not isolated again. Fourteen days after the commencement of the illness, the organism was found to agglutinate with the patient's serum to a titre of 1 :50, so a culture was sent to Dr. Bridges at the Dysentery Reference Laboratory at Oxford for further investigation.

The report received from Dr. Bridges stated that the organism was in fact motile. It had passed through a Craigie's tube in three days, and after such passages became actively motile. In addition the organism was found to produce a greenish yellow pigment on agar which diffused into the medium. The report concluded that the organism was probably a variety of *Pseudomonas*, but that it was not possible to differentiate it further.

Vulvo-vaginitis due to Sh. flexneri.

Sh. flexneri W was found to be the causative organism of vulvo-vaginitis in a European girl age seven years. (McGuinness and Telling, 1949). The patient had a copious vaginal discharge which showed abundant pus cells, and what appeared to be numerous gram-negative intracellular and extracellular diplococci. A gonnorrheal infection was suspected, but cultures for the gonococcus were negative. Instead a good growth of *Sh. flexneri* was obtained.

The condition which had been treated without effect with penicillin during the period of the laboratory investigation, responded immediately to local and oral sulphaguanidine.

It was later elicited that the child had had diarrhœa some seven days prior to the onset of the vaginal discharge. In view of this fact, several stools and rectal swabs were cultured, and although abundant pus cells were present in the fæces, no dysentery bacillus was isolated. If the child had had bacillary dysentery due to *Sh. flexneri* which seems a reasonable assumption, the inability to isolate the organism could be accounted for by the intensive sulphaguanidine therapy which had been instituted immediately *Sh. flexneri* was cultured from the discharge.

DISCUSSION

The number of isolations of dysentery bacilli presented do not of course indicate either the total incidence of bacillary dysentery in Dar es Salaam during the period under review, or the relative frequency of bacillary dysentery infection amongst the various races, because many cases especially amongst the Africans must, of necessity be diagnosed on clinical grounds alone.

The 118 strains reported from persons living in Dar es Salaam were isolated from sporadic individual cases, and were not associated with any particular outbreak of bacillary dysentery. The figures therefore probably give a fairly accurate picture of the types of dysentery bacilli and their relative frequency of occurrence. The fact that the organisms isolated were those that give rise to the milder types of infection is in keeping with the clinical picture of bacillary dysentery in Dar es Salaam.

It is noteworthy that the percentage frequency of the Flexner type (58) is approximately the same as that found for this group of bacilli in India during the period 1932-1935, and in the Middle East Forces 1940-1943. (Boyd, 1946).

General Summary

1. Twenty-eight strains of *Salm. typhi* were isolated in Dar es Salaam during the period Iarch, 1947, to April, 1949. Significant laboratory findings in connection with these cases re described.

2. Only two cases of paratyphoid fever, one due to *Salm. paratyphi A* and the other to *alm. paratyphi B*, were detected, and there is serological evidence that paratyphoid fever is elatively infrequent in Tanganyika.

3. Thirteen different strains of other Salmonella were isolated, of which four appear to be ew strains. The clinical conditions associated with the isolation of these organisms are briefly escribed.

4. One hundred and eighteen strains of typical dysentery bacilli were isolated from persons ving in Dar es Salaam, the percentage type distribution being Flexner 58 per cent, Sonne 31 er cent and Schmitz 11 per cent. *Sh. shigœ* was isolated from one case of dysentery outside ar es Salaam.

5. Inagglutinable dysentery-like bacilli were isolated from four cases of clinical bacillary ysentery. One strain, on further investigation, was considered to be probably a varicty of seudomonas.

6. Mention is made of a case of vulvo-vaginitis due to *Sh. flexneri*.

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Acknowledgments

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TABLE A

Table showing clinical symptoms associated with the uncommon Salmonella isolated

Type of Salmonella	PATIENT		Clinical Condition	Duration	Remarks
	Race	Age			
Salm. adelaide	European	34 years	Afebrile diarrhœa	4 days	
Salm. anatum	European	Middle-aged 40—50	Diarrhœa and mild persistent pyrexia	Not known	
Salm. braenderup	European	32 years	Diarrhœa, nausea and pyrexia	3 days	
Salm. chandans	African	Adult (young)	Septicaemia	5 months	
Salm. newport	European	58 years	Acute gastro-enteritis	4 days	
Salm. rubislaw	European	8 months	Acute diarrhœa and pyrexia	5 days	
Salm. urbana *Salm. poona*	European	3½ years	Diarrhœa and slight pyrexia	2 days	
Salm. waycross	European	5 months	Acute gastro-enteritis	3 days	
Salm. zanzibar	European	Adult	Afebrile diarrhœa	2 days	
Salm. "*mgulani*"	European	23 years	Acute enteritis	3 days	New strain
Salm. "*lindi*"	European	Adult	Diarrhœa and slight pyrexia	1 month (approx.)	New strain
Salm. "*uzaramo*"	African	Adult (young)	Enteric	1 month	New strain
Salm. "*ndoro*"	African	Adult	Enteric	Not known	Widal suggestive of *S. typhi* infection

Table showing Laboratory findings associated with the Salmonellæ isolated

No.	Type of Salmonella	Characteristics of Stool Specimens	ISOLATION FROM FÆCES			Other Sources of Isolation	AGGLUTINATION WITH PATIENT'S SERUM	
			Direct Plating	Sel.—F	Tet. Broth		"H" Susp.	"O" Susp.
1.	*Salm. adelaide*	Soft specimen with no abnormalities	—ve	+ve	+ve	—	Not performed	Not performed
2.	*Salm. anatum*	Watery stool, but no pus or red blood cells	—ve	+ve	—ve	—	do.	do.
3.	*Salm. braenderup* ...	Soft stool, with no abnormalities	—ve	+ve	—ve	—	do.	do.
4.	*Salm. chandans*	Soft stool, many hookworm ova present	+ve	+ve	—ve	Blood pericardial fluid pleural pus	1:1280	1:250
5.	*Salm. newport*	Mucoid stool with traces of blood and mucus	+ve	—	—	—	Not performed	Not performed
6.	*Salm. rubislaw*	Pale yellowish soft stool with scanty mucus	+ve	—	—	—	do.	do.
7.	*Salm. urbana*	Formed stool, no abnormalities	—ve	+ve	—ve	—	do.	do.
8.	*Salm. poona*	Soft stool with a few pus cells	—ve	—ve	+ve	—	do.	do.
9.	*Salm. waycross*	Blood stained stool with much mucus	+ve	—	—	—	do.	do.
10.	*Salm. zanzibar*	No abnormalities	+ve	+ve	+ve	—	do.	do.
11.	*Salm.* "*mgulani*" ...	Liquid stool with mucus abundant pus and red blood cells	+ve	—	—	—	1:50 (4 months) after illness	—ve
12.	*Salm.* "*lindi*"	Watery specimen with pus cells	—ve	+ve	+ve	—	Not performed	Not performed
13.	*Salm.* "*uzaramo*" ...	No abnormalities	—ve	+ve	+ve	Blood	1:250	1:125
14.	*Salm.* "*ndoro*"	No abnormalities	—ve	+ve	—ve	—	—ve	—ve

TABLE C

Biochemical reactions for the uncommon salmonellæ isolated

	Lactose	Glucose	Mannitol	Dulcitol	Sucrose	Dextrin	Inulin	Galactose	Sorbitol	Xylose	Arabinose	Maltose	Rhamnose	Inositol	Adonitol	Salicin	H2S Production	Methyl Red	V.P. Reaction	Indole	Citrate	Gelatin	Motility
1. *Salm. adelaide*	0	+	+	+	0	0	0	+	+	+	+	+	+	0	0	0	+	+	0	0	+	0	+
2. *Salm. anatum*	0	+	+	+	0	0	0	+	+	+	+	+	+	0	0	0	+	+	0	0	+	0	+
3. *Salm. braenderup*	0	+	+	+	0	0	0	+	+	+	+	+	+	+	0	0	+	+	0	0	+	0	+
4. *Salm. chandans*	0	+	+	+	0	0	0	+	+	+	+	+	+	0	0	0	+	+	0	0	+	0	+
5. *Salm. rubislaw*	0	+	+	+	0	0	0	+	+	+	+	+	+	+	0	0	+	+	0	0	+	+	+
6. *Salm. urbana*	0	+	+	+	0	0	0	+	+	+	+	+	+	0	0	0	+	+	0	0	+	0	+
7. *Salm. poona*	0	+	+	+	0	0	0	+	+	+	+	+	+	0	0	0	+	+	0	0	+	0	+
8. *Salm. waycross*	0	+	+	+	0	0	0	+	+	+	+	+	+	0	0	0	+	+	0	0	+	0	+
9. *Salm. zanzibar*	0	+	+	+	0	0	0	+	+	+	+	+	+	0	0	0	+	+	0	0	+	0	+
10. *Salm. "mgulani"*	0	+	+	+	0	0	0	+	+	+	+	+	+	+	0	0	+	+	0	0	+	0	+
11. *Salm. "lindi"*	0	+	+	+	0	0	0	+	+	+	+	+	+	0	0	0	+	+	0	0	+	0	+
12. *Salm. "uzaramo"*	0	+	+	+	0	0	0	+	+	+	+	+	+	0	0	0	+	+	0	0	+	0	+
13. *Salm. "ndoro"*	0	+	+	+	0	0	0	+	+	+	+	+	+	+	0	0	+	+	0	0	+	0	+

(1) 0 = Negative.
+ = Positive.
(2) Incubation for fermentive reactions was continued for 21 days.